FLIGHT

First Aero Weekly in the World.

A Journal devoted to the Interests, Practice, and Progress of Aerial Locomotion and Transport.

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The model—"Droit ou tu Dois"—which secured the first prize of the Ae.C. de France for a monument to the glory of French aviation.

EDITORIAL COMMENT.

The Future of the Dirigible.

Have we become so obsessed by the marvellously rapid development of the aeroplane that we are in danger of losing our sense of proportion, and dangerously neglecting the possibilities of the dirigible? The question is suggested by an interview published recently by the Paris *Matin*, in which Count Henry de la Vaulx states that the Germans have apparently overcome all the difficulties that seemed to beset the problem of the "rigid" type of airship. A year ago, he says, the Zeppelins could not rise high enough to be dangerous, but now the type can ascend to 2,000 metres, carrying a much greater weight than the non-rigid French balloons. It has a radius of action of over six hundred miles; and ascent and descent can be regulated with the greatest nicety. Count de la Vaulx draws a moving picture of a German dirigible fleet sailing calmly over France, dropping explosives on railway bridges and fortifications, spreading panic in towns and villages, and transmitting valuable information to headquarters by means of powerful wireless telegraphic installations.

No one would dream of questioning the authority of Count de la Vaulx, whose name is a household word in aeronautic circles, not only in France but wherever the science of aerial flight is studied; but we cannot help thinking that in the expression of his opinions he has been guided to some extent by his well-known devotion to ballooning as opposed to dynamic flight. Not that those opinions are to be lightly dismissed as chimerical or far-fetched, but the reply to his picture is best made by the enquiry:—What would the French aeroplane fleet be doing while the German dirigibles were spreading death and destruction through the length and breadth of France? That, however, is scarcely the question we desire to discuss at any length just now. The real point at issue is that contained in the query with which this article commences. In England, whatever may be the case elsewhere, the big dirigible is certainly resting under a cloud at the moment, and we are bound to say, deservedly so. We have seen the "Clement-Bayard," a non-rigid vessel, arrive after a successful voyage from France, albeit months overdue, and vanish at once into obscurity. Then followed the semi-rigid "Lebaudy," which met with even worse luck, and wrecked herself almost the first time it was attempted to fly with her. Next we had the crowning catastrophe of the rigid Naval airship at Barrow. Here we have had object lessons, and expensive ones at that, in what is to be anticipated from each of the three types, rigid, semi-rigid, and non-rigid, as we know them to-day and if that was all there is to be considered there would be a great deal of reason for the condemnation of the dirigible and for concentrating our efforts solely on the development of the heavier-than-air machine. It has to be remembered, too, that the first practical navigable balloon ante-dated the first successful aeroplane by a good many years, so we easily arrive at the conclusion that the development of the one has not been at all commensurate with that of the other, time for time. Taking everything into consideration, the case against the big dirigible seems, on the face of it, a convincing one. That being so we are not setting out to argue against that case, but at the same time it is well to remember that even though progress has not been anything like as rapid as in the case of the aeroplane, still a great deal of progress has been made, and it would be foolish to lay down the dictum that the dirigible is incapable of still further development. In the light of our present knowledge it is exceedingly difficult to suggest along precisely what lines that future development may take shape—that is a matter which the future alone can make clear—but it is far safer to assume that progressive improvement—we think with the smaller type—will be achieved than to dismiss the navigable balloon as a failure for all time. Indeed, Count de la Vaulx tells us in unmistakable terms that the Germans have improved the Zeppelin type out of all knowledge, which argues that this progress *is* actually in being.

Now what of the British attitude towards the dirigibles? In the past we have been counted among the most mordant critics of the Government policy of spending money in playing with dirigibles, and now that the lesson which we and others prophesied would be learnt has been driven home and assimilated, it would ill become us to start out on the advocacy of a great building of dirigibles for the Navy and Army. That we certainly do not intend to recommend, but we run no risk of stultifying ourselves by saying that even though the experience of the two Services with these vessels has been so disastrous, it will still be well to keep a very close and watchful eye on development. That we believe is actually being done, for it is a fairly open secret that in spite of everything, there is a section of military opinion which inclines towards the lighter-than-air vessel in preference to the aeroplane. But more than watching should be done. If possible it would be an admirable plan to have a separate money grant, altogether distinct from the aeroplane expenditure with which to carry on this work. We suggest a separate fund in order to avoid the possibility of being misunderstood in our advocacy of dirigible development. We firmly believe that the Government has no right to allow any branch of aeronautics to be held in abeyance. On the other hand it is far more important to develop the aeroplane for military purposes just at present than the dirigible and we should be particularly sorry to see any other branch of aeronautics be the means of withdrawing the money that it is so necessary to use in this particular section. It seems to us that there are two separate policies required for dealing with the two branches of aerial navigation, if we may put it thus. The careful development of the dirigible is already outlined, and in the case of the aeroplane, immediate and active work on such a scale as is necessary to put us on something at least approaching equality with our rivals. It is necessary, we think, that the case should be thus outlined, lest at some time we have the realisation rudely thrust upon us that the answer to our initial query is in a decided affirmative.

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The Dawn of Another Year.

We should be less than human if we let slip this, the first opportunity of another year, to wish our many friends and readers a season of happiness and prosperity during 1912. What the new year has in store for us none of us know, and possibly it would not be good for us to know. Therefore, let us forbear to speculate on what will emerge from the mist of the future and content ourselves with the simple expression of good-will which is so clearly if conventionally expressed by the orthodox wish of the season, A happy and a prosperous New Year to all. And in this we are but reciprocating the great batch of greetings received from readers in all parts of the world.

FLIGHT PIONEERS.

MDME. JANE HERVEU,

Who, in competition for "La Coupe Femina," put up a flight at the Compiegne Aerodrome on December 31st, on a Blériot monoplane, of 248 kiloms. in 2 hrs. 41 mins.

THE BRITISH WAR OFFICE TRIALS.

SOME MORE MANUFACTURERS' VIEWS OF THE CONDITIONS.

Mr. J. C. Mort (New Engine [Motor] Co., Ltd.):—

In expressing our opinion on the War Office competition, we do not think we could do better than say that we thoroughly agree with your leader on this subject. It would be somewhat out of our province for us to criticise the competition from the point of view of the aeroplane builder, and we can only await the decision of the constructors as to what engines they require. We trust this information will be forthcoming at an early date so as to give the engine builders a reasonable chance of doing the necessary work.

It strikes us very forcibly that the engine builder is kindly requested to do a very great deal. Not only are there several special conditions which apply to the engines only, such as the silencers and an arrangement so that the pilot can start the engine from the machine, but in practice success on almost every point depends on the engine, and yet there is to be no reward for the engine builder.

There seems to be an assumption, which we think is totally unjustified, that the English engine builder is actually further behind as compared with the foreigner than is the English aeroplane constructor, and yet the engine builder is absolutely ignored so far as the prizes are concerned, though he is by no means ignored so far as the demands of the competition are concerned It is certainly difficult to understand on what principle the engines have been so entirely ignored. It is beyond all question that the production of a satisfactory aeroplane engine is a matter of great difficulty, involving not only a large amount of work but a very large expenditure of money, and if it is right that there should be a national prize for aeroplane constructors, and if it is considered that this is wise in the interest of the nation, then we should have thought it equally just and equally wise that some provision should have been made for the engine builders. However, it is useless to lament over what has not been done.

In view of the fact that, as we understand the position, all aeroplanes ordered as a result of this competition will have to be built throughout in this country, it will obviously be in the interests of the English constructors to employ English engines if possible, for if they employ foreign engines and then receive an order for fairly quick delivery and have made themselves dependent on foreign engines, they may find themselves in an awkward position, for the manufacture of aeroplane engines cannot be taken up at a day's notice.

So far as providing engines for the competition is concerned, there does not seem to be any insurmountable difficulty facing the English engineers. Certainly, engines of greater power than any hitherto turned out in this country would be required, but this only means that the firms concerned must be prepared to make a still further expenditure of money. So far as the New Engine Co. is concerned, we are prepared to make this expenditure and to produce engines of the necessary power, and we trust that in return we shall meet with the support of the English constructors.

The writer was present at the recent meeting of the Aeronautical Society, when Col. Seely spoke with the greatest possible emphasis. His words were sufficient to conjure up a lurid picture of what was likely to happen to the nation which had failed to provide itself with war aeroplanes. He spoke of the possibility of war within the next two or three years. He declared in no half-hearted way that the Government fully realised the position, and were determined to make the necessary expenditure. If Col. Seely meant all he said, we cannot in the least comprehend how he squares it with the Government's expenditure of a miserable £11,000. If it is vitally important that this country should be ready within the next two or three years, then it is criminal folly to waste nine months twiddling our thumbs while we are waiting for a competition which may or may not produce something better than we can get to-day. When dealing with such a problem as flying, a period of two years seems to slip past as though it were only so many months. It is vital that every moment of this time shall be used to the fullest extent possible, and that means a continuous expenditure of money.

We should like to put the matter into figures as that would bring out better than any mere words the utter inadequacy of the Government's present proposal. It would be by no means excessive if a dozen first-class men were continually at work in this country on aeroplane work. It would not be excessive if those men were each rewarded to the extent of £1,000 a year apiece, that is £12,000. It would not be excessive if each of these men had the expenditure in his works of £10,000 per annum, that is a further total of £120,000. It is only necessary to compare these figures with the idiotic £11,000 provided by the Government to realise that either they do not realise the problem or they are endeavouring to get something for nothing. It is quite obvious that the figures we have given are a long way below the figures that are applicable to France to-day. We should have thought it would have been time enough to have talked about competitions and progress when the Government had actually made some reasonable foundation expenditure.

Mr. W. O. Manning:—

The conditions of the War Office prize are, I think, generally speaking, excellent, and will produce a machine in every way suitable for military requirements. There are, however, a few minor points to which I should like to draw attention.

The first is Rule 1, which specifies that the machine must be packed in a case 32 ft. by 9 ft. by 9 ft.; this restricts the length of the fuselage it is possible to fit to a monoplane or biplane, unless one is prepared to make this important member to divide into two pieces, a method of construction it is desirable to avoid. It seems to me undesirable that aerodynamical considerations may have to be made subservient to the dimensions of the case. I may also point out that large 4-bladed propellers are impossible for the same reason, unless they are constructed by placing two 2-bladed propellers one on top of the other, their blades, of course, being at an angle of 90° to each other.

Rule 3, which requires competing machines to climb at the rate of 200 ft. per minute to a height of 1,000 ft., is much more severe than that imposed in the French trials. The best trial by the winner of these, Weymann, on the Nieuport, climbed at the rate of 45·5 metres per minute, which is equivalent to 149 ft.

Rule, 5, requiring a gliding angle of 1—6, is a very stiff requirement, and one which may be difficult to measure. It must not be forgotten that a following wind has the effect of making a gliding angle appear considerably less than it really is. The other requirements are excellent and do not, I think, require comment.

Mr. Handley Page (Handley Page, Ltd.):—

The one glaring feature in which the competition falls short is in the small amount of prize money allotted to the scheme.

Turning to the actual conditions:—

1. The packing case specified would take practically any machine made.

2 and 4 would be easily carried out, but No. 3, if the desired speed of 300 ft. per minute is to be attained, will be extremely difficult to fulfil. It would seem probable that makers will rest content with the specified minimum of 200 ft. per minute.

5. So far as model tests go the only machine to nearly fulfil this condition is the Paulhan-Tatin, which, according to the latest tests by Eiffel, has a gliding angle of 1 in 5·9. It will also be difficult to measure, on account of the invariable presence of slight currents of air which may easily make or mar the result.

6. Is not difficult to fulfil.

7. Will require the use of some sort of brake such as the Albatross or Aviatic machines use. The machine must be well balanced on the wheels to be easily steered on the ground, so that a heavily loaded tail skid is out of the question.

8 and 9. Easily fulfilled.

10. This condition would put a premium on an engine behind pilot first type of machine, and would favour a Wright aeroplane or a "Canard" type.

11. A most desirable condition from the point of view of the purchaser.

13. This condition read with the latter half of No. 7 and No. 14 (*a*) entails the use of an engine which can be effectively throttled down.

14. To reduce the strain on the pilot, a simple control and great stability is necessary. Thus 14 (*c*) and (*g*) run hand in hand.

There are few machines which have a wide range of speed; let us hope that this will encourage some practical scheme to be evolved for altering the area of the plane. There are many pitfalls for those who start on this line.

14 (*e*) is ensured by condition No. 5.

The importance of condition No. 14 (*f*) and (*h*) cannot be judged until one knows the value set on these "attributes" by the authorities. Certainly, in conjunction with conditions 1 and 8 a scheme of marking might be drawn up, and some idea of this given to constructors, so that the importance of making the machines very "demontable," in preference to securing say a slightly better wing shape, could be estimated. It is, however, distinctly good that attention is paid to this detail.

Condition 14 (*g*) will be somewhat thrilling for the pilot to carry through. It is well that the 30 ft. is specified only in a "desirable attribute."

Generally the details of the scheme are good and well thought out. It is well that provision for auxiliary apparatus such as wireless, guns, &c., have been left out, as such conditions would only tend to alter the designs of the machines to fit in with artificial conditions instead of letting the design be formulated to suit true aerodynamic requirements. Time enough for these details when aeronautical work has advanced further forward.

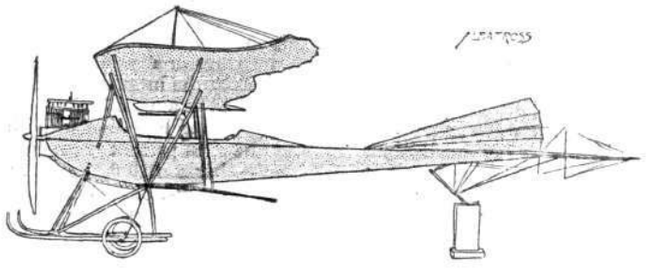
FLIGHT

PARIS AERO SHOW.

(Continued.)

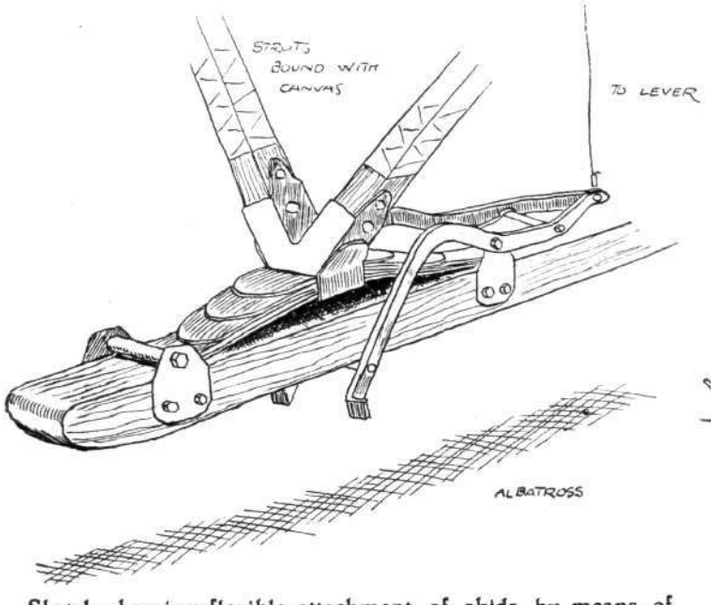
Albatross.

THIS interesting biplane is of the engine-in-front type, and altogether one of the finest examples of workmanship in the Salon. Its fuselage is covered throughout the whole of its length with a thin veneer of wood, the radiator being disposed under the front, below the engine, where it does not interfere with the graceful outline of the



The Albatross engine-in-front type biplane.

machine, and where it is in a position to receive the maximum amount of cooling draught from the propeller. Its main planes are trussed by a system of wooden-compression struts, no wire bracing being employed. The top main-plane is slightly longer in span than the lower one, and its extremities are turned back and given a negative angle of incidence, much after the same manner as that employed by the Etrich machines. Its landing gear is easily the soundest and strongest of all those present at the Salon. In its main outline it has much in common with the ordinary Farman chassis, but possesses the extra advantage that the struts supporting the fuselage are not



Sketch showing flexible attachment of skids by means of laminated steel springs, and landing-brake on the Albatross biplane.

directly attached to the skids, but applied flexibly thereto by the interposition of laminated steel springs. The horizontal stabilising surface is triangular in plan form, and extends backwards from a point level with the rear of the pilot's seat. This surface continues behind the end of the fuselage, and is flexed for the purpose of giving the machine an upward or downward direction.

Principal dimensions, &c. :—

Length ...	... 34 ft.	Weight	... 925 lbs.
Span ...	... 44 ,,	Speed ...	... 55 m.p.h.
Area ...	... 440 sq. ft.	Motor ...	... 100-h.p. Argus.
	Price ...	... £1,200.	

Aviatik.

CONSIDERING that only three weeks elapsed between the commencement of the construction of this handsome monoplane and its appearance in all the glory of its resplendent nickel fittings on the opening day of the Salon, it must be observed that the ability to accomplish such a performance speaks well for the excellence of personnel and organisation at the Aviatik works.

Although built under Hanriot licence, there is little to acquaint a casual observer of the fact except that the general disposition of its respective parts is very similar, and that the design of the tail is nearly identical.

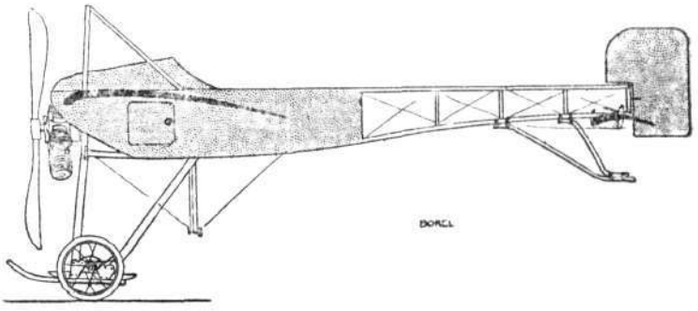
The main body is constructed like the hull of a racing skiff, and at its forward extremity is disposed the motor—an Aviatik of 100-h.p. Petrol is fed by pressure from a tank under the passenger seat to an auxiliary tank slung from the *cabane*, and from this point the feed is by gravity. The landing gear is closely allied to the Henry Farman design, but has the peculiarity that all four wheels are mounted on one common axle. The struts supporting the skids are hollow, with the exception of the front pair. It is a noticeable feature that both German machines at the Salon, the Albatross and the one at present under review, are equipped with hand-brakes in order that they may be brought to rest as soon after landing as possible. In cross-section the wings closely resemble those of the Nieuport. Mounted directly in front of the pilot is the control wheel, which is arranged vertically at the upper end of a pivoted vertical column. The elevation is governed by a to-and-fro movement, warping by rotating the wheel laterally.

Principal dimensions, &c. :—

Length ...	... 31 ft.	Weight	... 990 lbs.
Span ...	... 41 ,,	Speed	... 70 m.p.h.
Area ...	... 275 sq. ft.	Motor	... 100-h.p. Aviatik.
	Price ...	... £1,000.	

Borel Monoplanes.

BOTH the monoplanes shown on the Borel stand, a 50-h.p. single-seater and a 70-h.p. military two-seater, are identical so far as their general outlines are concerned, with the machine with which Vedrines made such a good performance in connection with the *Daily Mail* Circuit of Britain. On this account a lengthy description is scarcely necessary. The main features evident in the machine are the absence of dihedral angle between the wings, the simple and neat landing gear, the *port-a-faux* mounting of the Gnome engine, a system which lends itself to great neatness of design and accessibility, and the lightness of the construction throughout.



Borel monoplane.

Principal dimensions :—

Length ...	... 23 ft.	Weight	... 550 lbs.
Span ...	... 30 ,,	Speed	... 70 m.p.h.
Area ...	... 154 sq. ft.	Motor	... 50-h.p. Gnome.
	Price ...	... £880.	

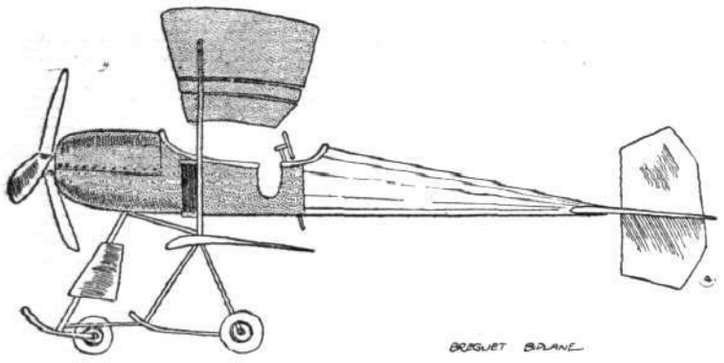
Two-seater military :—

Length ...	... 26 ft.	Weight	... 600 lbs.
Span ...	... 40 ,,	Speed	... 60 m.p.h.
Area ...	... 220 sq. ft.	Engine	... 70-h.p. Gnome.
	Price ...	... £1,020.	

Breguet.

AMONGST the biplanes present at the Salon there is no doubt that the productions of the Breguet firm must be given pride of place by virtue of the excellence of their performances of the various military trials of the past year. One of the machines on view was the identical machine with which the pilot Moineau obtained second place in the final classification of the machines at the French military trials at Rheims. The machine with which Bregi carried out his flights in Morocco from Casa Blanca to Fez, which machine was previously used by de Montelant at Brooklands in beating the British height record with passenger, was given a place of honour in the gallery. The third was a standard type biplane fitted with a 75-h.p. six-cylinder Chenu motor, driving through reduction gearing a three-bladed Breguet-Regy propeller. In order to preserve more effectively the natural torpedo-like outline of the Breguet *fuselage*,

the engine is covered in by a neat housing of sheet steel. Further improvements had also been made in the bodywork itself, a miniature



The 100-h.p. Chenu-engined Breguet biplane.

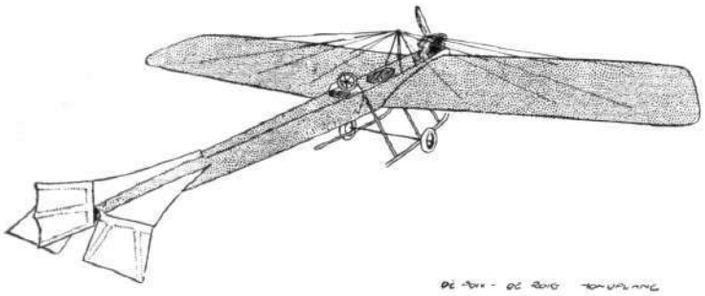
side-entrance door and light steel ladder being provided to facilitate ingress and egress.

Principal dimensions :—

Length ...	... 30 ft.	Weight	... 1,430 lbs.
Span ...	... 45 ,,	Speed	... 55 m.p.h.
Area ...	... 363 sq. ft.	Motor...	... 75-h.p. Chenu.
Price ...	... £1,400.		

De Poix et de Roig.

THIS two-seater monoplane presents little difference from standard practice, and consequently a few words will suffice to describe it. Its fuselage, 30 ft. in length, is a skiff-like structure much after the same idea as that originated by Hanriot. The motor, which is mounted in front of the body, is a 100-h.p. water-cooled Clerget, and drives a large diameter Rapid propeller. Its landing chassis is of the customary A-type wheel and skid class, having a track of just over six feet. Balancing is carried out by means or warping the main wings, which latter have a span of 37 feet, and this action is controlled from the steering-wheel that is mounted in an exactly similar fashion to that of the Deperdussin. The tail unit



The de Poix-de Roig monoplane, recalling, in a general way, Hanriot practice.

is almost identical with that of the Hanriot with which we are all familiar, a flat plane acting as a stabiliser, while to its rear edge are hinged two small planes serving as elevators.

Goupy.

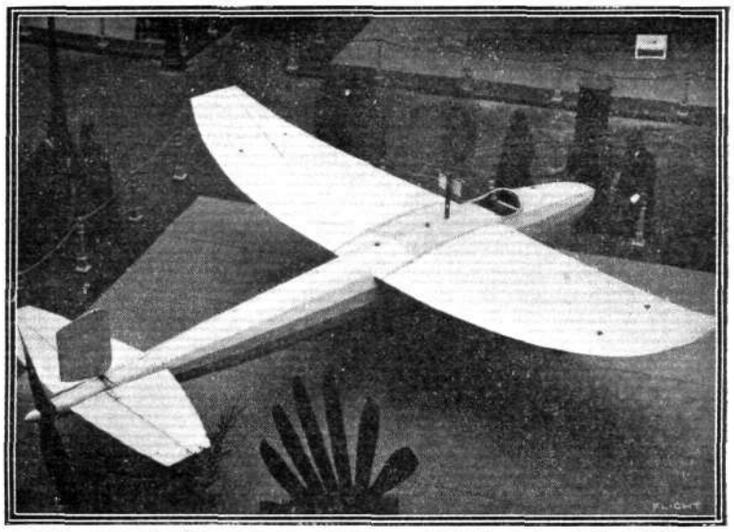
ALTHOUGH in its general appearance the Goupy biplane, as exhibited at the Salon, differs little from the machine with which readers of FLIGHT are familiar, through its appearance at the last Doncaster meeting, one or two important changes have been made, with the result that it now no longer bears such a close resemblance to the Blériot. Besides adopting a monoplane tail in place of the biplane unit previously employed, the operation of the controls is no longer brought about from a single vertical column, but has, in this latest machine, been divided, the steering to right and left being operated from a pivoted foot-lever. The essentially Blériot-type of landing-gear has also disappeared in favour of a Sommer-type wheel-and-skid combination.

Principal dimensions :—

Length ...	... 23 ft.	Weight	... 550 lbs.
Span ...	... 23 ft.	Speed	... 55 m.p.h.
Area ...	... 242 sq. ft.	Engine	... 50-h.p. Gnome
Price ...	... £1,120.		

Les Fils de Regy Frères.

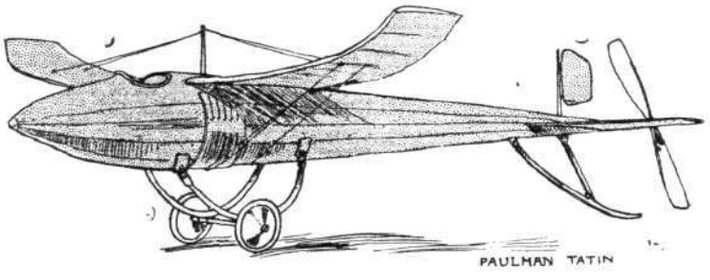
THE most prominent exhibit on this stand was the aero torpedo of Paulhan and Tatin. This interesting machine, of which photographs have appeared from time to time in FLIGHT, is a sincere attempt on the part of the designers to gain greater speed and greater stability by the cutting down of as much head resistance as possible. The body itself is of excellent stream-line form, the fabric covering, which extends right from end to end, being supported on circular wooden hoops, which are applied over the fuselage proper of ordinary box-girder construction. The main peculiarity about the machine is that the propeller, a Regy Frères, is disposed at the extreme rear end of the main body, and is driven by means of a tubular steel shaft by a Gnome engine of 50-h.p., situated just to the rear of the pilot. This shaft is not universally jointed, but rigid from motor to propeller. Very little camber and very little angle of incidence is evident in the wings, which are of an approximate elliptical plan form, and which are up-turned at the tips in order to endow the machine with a modicum of natural stability. It is interesting to note that no warping of the wings or any other method of maintaining lateral balance, other than by the inherent effect of the up-turned tips, is provided for, and this fact almost leads one to believe that Paulhan had in his mind visions of litigation with the Wright brothers, on which, by the way, he is at present engaged in the States. The tail surfaces consist of a horizontal flat plane, to the rear edge of which is hinged a pair of flaps, one on each side of the main body, which perform the function of elevators, while



THE AERO TORPEDO OF PAULHAN AND TATIN —With this monoplane speeds up to 140 kiloms. per hour have been obtained.

steering to the right and left is brought about by a vertical-balanced rudder mounted above the horizontal surface. Protection is afforded against damage to the propeller by a very high tail-skid.

The landing chassis is a very unique conception, and while being extremely strong and simple has the extra advantage of presenting little resistance to forward advance. The common axle connecting the two pneumatic-tyred disc wheels is rigidly attached to two roughly semi-circular sweeps of ash. These sweeps are hinged to the main body at their forward ends, and at their rear ends are connected by a piece of wood which in turn is strapped down to a

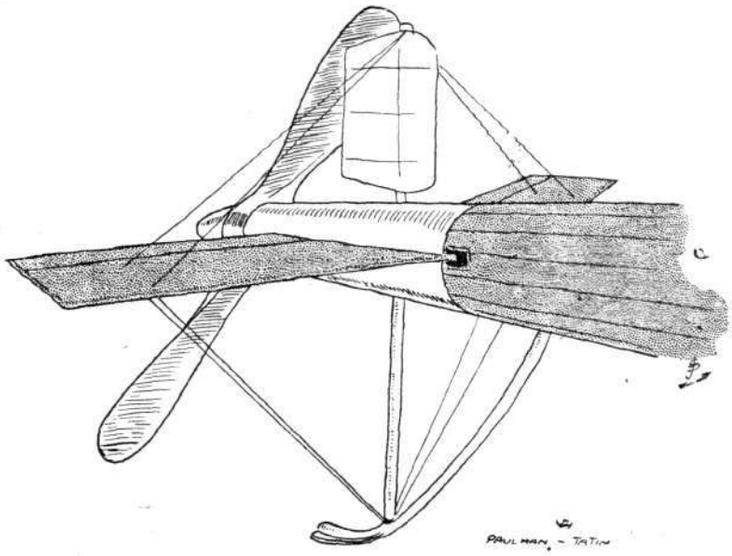


The aero torpedo, the result of the collaboration of Messrs. Victor Tatin and Louis Paulhan.

reinforced fuselage cross-member with rubber cord. In this manner the shock-absorbing device is arranged in the interior of the fuselage, and in addition to resistance being reduced on this account, the system lends itself to extreme neatness and clearness of design.

As evidence of the advantages which are to be gained by the reduction of head resistance, it is interesting to mention that speeds of 88 miles per hour have been attained, presumably in still air, by this monoplane, and this with an engine of only 50 h.p.

Besides this interesting monoplane, a full selection of beautifully-constructed Regy Frères' propellers is exhibited on this stand.



Tail-unit and propeller—Paulhan-Tatin monoplane.

Principal dimensions, &c. :—

Length	28 ft.	Weight ...	800 lbs.
Span	28 ft.	Speed... ...	88 m.p.h.
Area	140 sq. ft.	Motor... ...	50-h.p. Gnome.
	Price ...	...	£1,000.

Kauffmann.

THE Kauffmann monoplane, while in its broad outline it has much in common with the general run of monoplanes, is chiefly remarkable for the size and shape of its wings. These are arched and turned up at the tips and are only a matter of 2 ft. in chord measurement.

The method of staying them is also interesting.

Four-stranded steel cables, two to each wing, take the weight of the machine in flight, and at a suitable distance from the wing these cables split up into a number of smaller wires, each of which is attached to its corresponding rib in the wing structure. By this system, although the head-resistance of the machine as a whole is increased, a great measure of security is obtained; in fact the constructors claim a safety factor of 25.

The main body is of the ordinary box-girder type, cross-braced with steel wire, and covered in in the front with aluminium sheeting and to the rear with fabric. A 50-60-h.p. radial Anzani motor, direct coupled to a Centrale propeller, is installed at the forward end of the *fuselage*. The tail is triangular in plan form, and does some of the share of the lifting. Hinged to it is the elevator, and the whole is protected from ground contact by a large flexible skid of malacca cane.

Warping is employed for lateral balance, this being operated, together with the elevating surface, from a central lever in the pilot's cockpit.

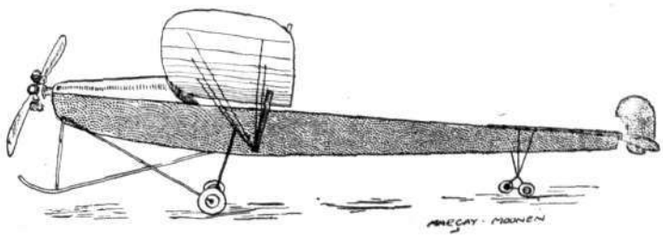
Principal dimensions, &c. :—

Length	24 ft. 8 ins.	Weight ...	572 lbs.
Span	35 ft.	Speed ...	85 m.p.h.
Area	154 sq. ft.	Engine ...	50–60-h.p. Anzani.
	Price ...	...	£800.

Marçay-Moonen.

THIS interesting monoplane, illustrations of which appeared in FLIGHT for December 9th, 1911, constructed to the designs of M. Henri Chazal, is interesting for the fact that its wings are pivoted, by which system their angle of incidence may be varied at the will of the pilot while in flight, and on landing they may be folded back against the fuselage by the mere turning of the wheel on the right of the pilot. To effect this each wing is mounted on and braced to a mast, which is attached at an angle to the fuselage. The adjustment of the wings for balancing purposes is made from the pilot's control wheel. Supposing the machine to be dipping on the left-hand side, the control wheel will be rotated towards the right, which action advances the axis of the left wing, and retards the axis of the right wing a similar amount. It is by virtue of the oblique mounting of the masts that the advancing or retarding of the wings causes their angle of incidence to be increased or diminished respectively.

The convenience of this method of wing-mounting is amply demonstrated by the fact that the machine was towed through the streets of Paris from its hangar at Issy-les-Moulineaux to the Grand Palais without being dismantled; and its re-erection at the latter place merely consisted of about a dozen rotations of the wing operating-wheel. To further assist the ease with which the machine may be steered over the ground, the rudder is made to work in conjunction with a pair of pivoting wheels, situated under the tail. The landing-chassis is identical with that of the Zodiac biplane, except that no provision is made for the accommodation of any sideway's movement in landing. Its propulsive group consists of a Gnome engine and a



The Marçay-Moonen monoplane, with pivoting wings.

Chauviere propeller. Accommodation is provided for a passenger, and to lend a little realism to the assertion of the Marçay-Moonen people that their machine has been designed purely for military work, this latter's cockpit was equipped with a quick-firing gun and a wireless telegraphy installation.

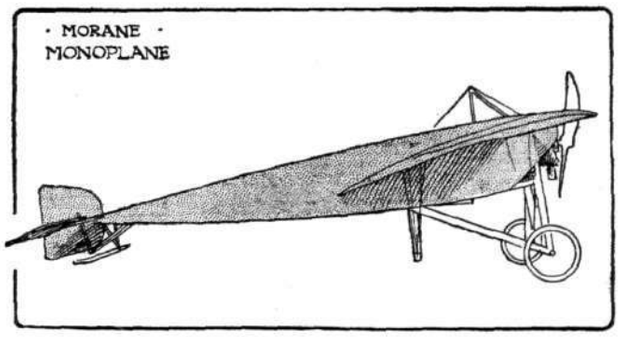
Principal dimensions, &c. :—

Length	40 ft.	Weight ...	990 lbs.
Span	45 ft.	Speed ...	55 m.p.h.
Area	440 sq. ft.	Motor ...	50-h.p. Gnome.

Morane-Saulnier.

THE exhibit on this stand consisted of four monoplanes, a school type, a military two-seater, a racing type, and an uncompleted all-steel monoplane. Both the little Anzani-engined school type machine, and the 70-h.p. military are identical as far as their general outline is concerned, the only difference in the two models being the slightly increased size of the more powerful machine. The fuselage in both cases is of the customary box-girder type, being fairly deep in the neighbourhood of the pilot's seat and tapering off from that point towards the tail where its termination may be represented by a horizontal line. In the case of the two-seater machine the 70-h.p. Gnome engine with which it is equipped is almost totally enclosed in a large oil-shield, an idea of which may be gained from the accompanying sketch. This feature is naturally omitted in the school machine, as this is fitted with a stationary air-cooled engine for the proper operation of which a maximum volume of air-cooling draught is imperative. Both are equipped with a Henry Farman type of landing gear, the only difference being that the skids, not being up-turned in front, are apparently not intended to come into action when landing, and the wheels are mounted in a slightly different manner. The fuel tanks are arranged under the steel wind-screen, which latter is heavily padded along its rear edge in order to prevent any personal damage to the pilot should he be thrown forward from his seat as the result of a heavy landing. The main body is covered in throughout its whole length to reduce head-resistance.

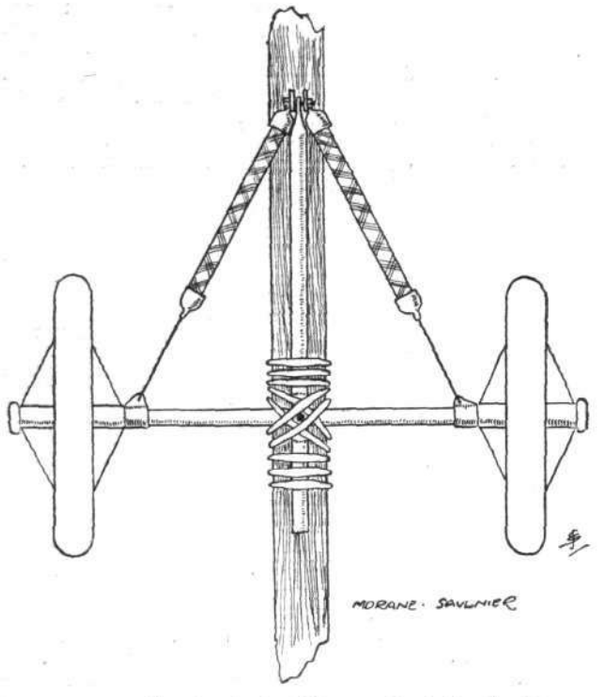
In its main characteristics the Morane-Saulnier racer is identical with the two machines already described, its only difference lying in the design of its under-carriage. This latter being entirely constructed of oval section steel tubing, to which are attached the two



The Morane monoplane.

landing-wheels. As no attempt has been made to endow the chassis with any degree of flexibility, it is doubtful whether it will

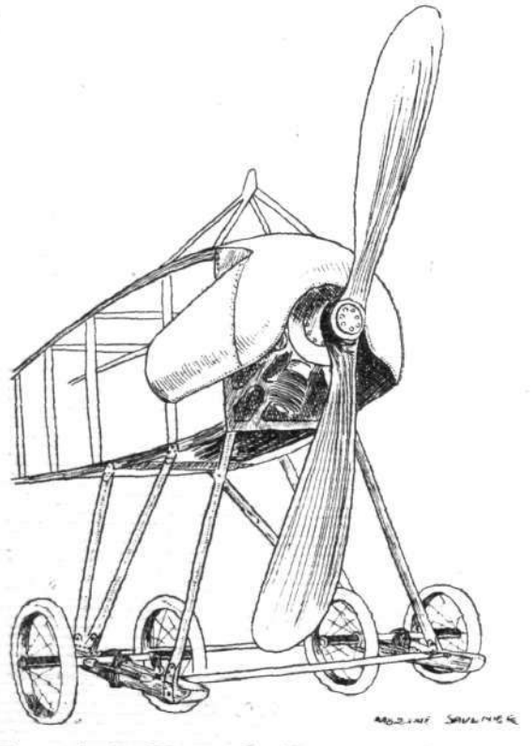
prove successful under the pilotage of any but the most expert pilots at landing, and even then the ground would have to be of an almost



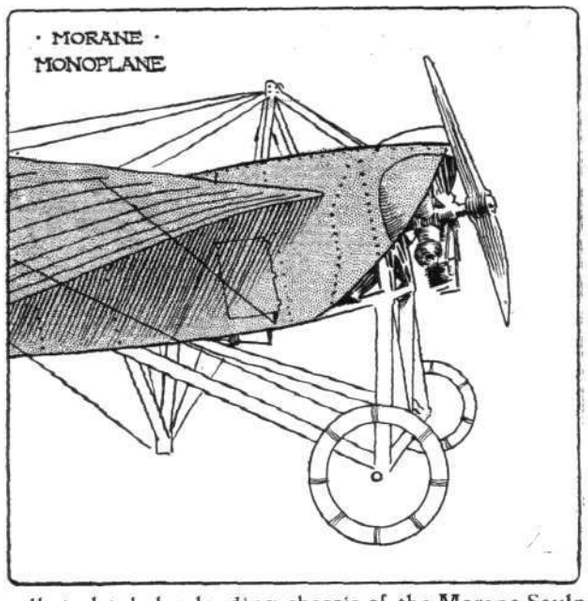
Diagrammatic sketch of the Morane-Saulnier landing gear.

billiard-table-like surface. The wings, in plan form, are similar to those on the Borel machine, and they are stayed by means of stranded steel cable to the middle point of the chassis. Control of the wing warping and the rear elevator is maintained from a vertical universally-jointed lever, of which the action is identical with the Blériot *cloche*.

The fuselage of the all-steel war monoplane, which is exhibited in an uncompleted stage, is of torpedo form and constructed throughout of sheet steel. From its blunt nose, which is ventilated, and which encloses the motor, to a point to the rear of the pilot's seat, this steel body is of circular section, but from that point to the tail it flattens out horizontally. Even the skeletons of the wings and the rear controlling surfaces are carried out very cleverly in metal.



Front of the Morane-Saulnier two-seater monoplane, showing arrangement of landing gear and of the oil-shield over the motor.



The all-steel tubular landing chassis of the Morane-Saulnier monoplane, in which no flexible suspension is provided.

Principal dimensions, &c. :—

School type—

Length	20 ft.	Weight ...	575 lbs.
Span	30 ,,	Speed ...	55 m.p.h.
Area	154 sq. ft.	Motor ...	35-h.p. Anzani.
	Price ...	... £680.	

Racer type—

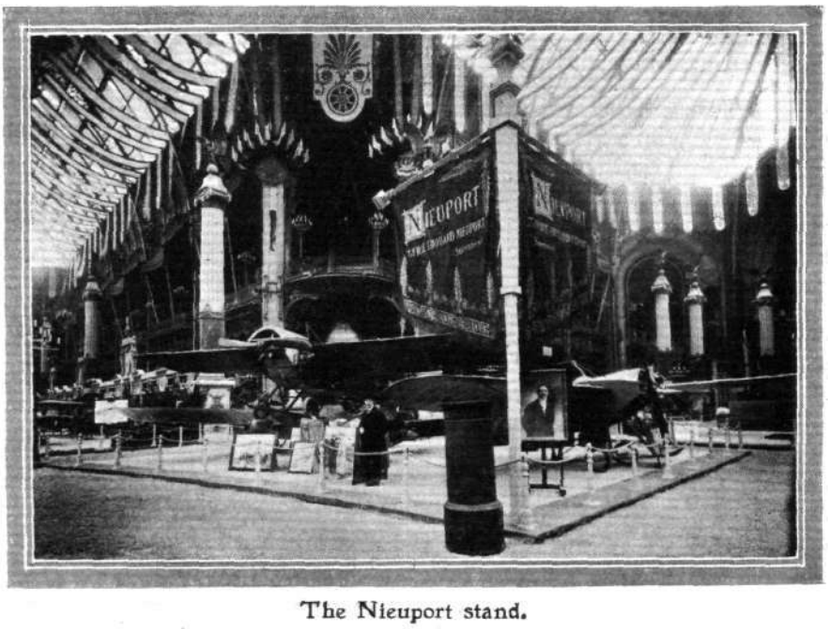
Length	20 ft.	Weight ...	630 lbs.
Span	30 ,,	Speed ...	75 m.p.h.
Area	120 sq. ft.	Motor ...	50-h.p. Gnome.
	Price ...	... £920.	

Military type—

Length	20 ft.	Weight ...	686 lbs.
Span	30 ,,	Speed ...	64 m.p.h.
Area	154 sq. ft.	Motor ...	50-h.p. Gnome.
	Price ...	... £960.	

Nieuport.

OCCUPYING one of the central stands in the Grand Palais were three Nieuport monoplanes, a 28-h.p. twin-cylinder school-type machine, and two 50-h.p. two-seater military machines. One of these latter was the identical machine on which the celebrated pilot Helen won the Coupe Michelin. No new features are evident in the



The Nieuport stand.

machines on exhibition, they being similar in every respect to the models which have competed so successfully in all the contests of the past year. Principal dimensions :—

School-type monoplane—

Length ...	... 24 ft.	Weight ...	550 lbs.
Span ...	... 28 ,,	Speed ...	70 m.p.h.
Area ...	... 176 sq. ft.	Motor ...	28-h.p. Nieuport
Price ...	... £720.		

Two-seater military—

Length ...	.. 26 ft.	Weight ...	700 lbs.
Span ...	... 36 ,,	Speed ...	70 m.m.h.
Area ...	... 250 sq. ft.	Motor ...	50-h.p. Gnome.
Price ..	... £1,040.		

The Royal Aero Club of the United Kingdom

OFFICIAL NOTICES TO MEMBERS

Notice to Members.

ATTENTION is drawn to the rules governing the Army and Navy Aviation Prizes of £1,000, presented by Mr. A. Mortimer Singer, and the British Empire Michelin Cup, No. 2, £600, which appear hereunder.

The Army and Navy Aviation Prizes close on March 31st, 1912, and the British Empire Michelin Cup, No. 2, £600, closes on October 15th, 1912.

Army and Navy Aviation Prizes.
(Presented by Mr. A. Mortimer Singer.)

(*Under the rules of the Royal Aero Club and Fédération Aéronautique Internationale.*)

Mr. A. Mortimer Singer has presented to the Royal Aero Club the sum of £1,000 for competition by commissioned officers in His Majesty's Regular Army, the Royal Navy, and the Royal Marines, on the active list.

The prize will be divided as follows:—

Army ... ... £500 Navy and Marines ... £500

to be competed for under the following conditions:—

1. The winner to be the officer who, accompanied by a passenger, also in the Regular Service (combined net weight to be not less than 20 stone), starting from any recognised flying ground, or other starting point sanctioned by the Royal Aero Club, makes on an aeroplane the longest cross-country flight out and back between April 1st, 1911, and March 31st, 1912, both days inclusive. The flight must be confined to the British Isles.

2. All competitors must hold an aviator's certificate issued by the International Aeronautical Federation, represented in this country by the Royal Aero Club of the United Kingdom.

3. The flight must be observed both at the start and turning point by officials appointed by the Royal Aero Club.

4. The flight shall be out and back, and the distance from the starting point to the turning point, measured in a straight line, shall be not less than 10 miles or more than 50 miles. A competitor may repeat his out and back flight for any number of times without alighting, and in order to arrive at the total distance covered only the completed circuits will be taken into account. The distance covered will be measured in a straight line between the two points on an Ordnance Survey map. The turning point must be a fixed object, selected and declared by the competitor to the observers of the flight.

5. A competitor must obtain a certificate signed by the observers as to the exact point of ascent and turning point and number of completed circuits, which must be forwarded to the Secretary, Royal Aero Club, 166, Piccadilly, London, W., within three days.

6. No prize will be awarded to any competitor who has not accomplished a flight of at least 40 miles.

7. Officers wishing to compete must send in their names to the Royal Aero Club, 166, Piccadilly, London, W., together with an entrance fee of 20s., after which they are at liberty to start at any time they please, subject to the necessary arrangements for observers having been made.

8. Should any questions arise at any time as to whether a competitor has properly fulfilled the above conditions, or should any other questions arise in relation to them, the decision of the Committee of the Royal Aero Club shall be final and without appeal.

British Empire Michelin Cup, No. 2, £600.

(*Under the rules of the Royal Aero Club and the Fédération Aéronautique Internationale.*)

The Michelin Tyre Company has presented to the Royal Aero Club of the United Kingdom for competition by British aviators, the sum of £600, to which will be added a trophy to be retained by the winner.

The following are the rules governing the competition for the year 1912:—

1. The winner for the year 1912 shall be the competitor who, on October 15th, 1912, shall have completed a prescribed circuit of about 186 miles on an aeroplane in flight in the fastest time, reckoned in miles per hour.

2. Competitors may select their own circuit of about 186 miles, but the start must be made from a flying ground approved by the Royal Aero Club, and the proposed circuit must be submitted to the Royal Aero Club before the flight is made.

The complete circuit must be accomplished without alighting.

3. The flight must be observed at each point named in the circuit by officials appointed by the Royal Aero Club.

4. A number must be prominently displayed on the aeroplane in places approved by the officials, and when flying round each of the points selected in the circuit, the aviator must fly sufficiently low so that his number may be easily verified by the official observer.

5. The circuit must be completed between the hours of sunrise and sunset, on any one day.

6. The entrant, who must be the person operating the machine, must be a British subject, flying on a British-made aeroplane, must hold an Aviator's Certificate, and must be duly entered on the Competitor's Register of the Royal Aero Club.

7. The complete machine, and all its parts, must have been entirely constructed within the confines of the British Empire, but this provision shall not be held to apply to raw material.

8. An entrance fee of £1 must accompany every notification of an attempt, and at least three clear days' notice must be given to the Secretary, Royal Aero Club, 166, Piccadilly, London, W. A competitor must further deposit a sum of £10 on account of expenses, if any, of observers. Any balance not so expended will be returned to the competitor.

9. Should any questions arise at any time after the date of entry as to whether a competitor has properly filled the above conditions, or should any other question arise in relation to them, the decision of the Royal Aero Club shall be final and without appeal.

10. A competitor by entering waives any right of action against the Royal Aero Club or the Michelin Tyre Co. for any damages sustained by him in consequence of any act or omission on the part of the officials of the Royal Aero Club or the Michelin Tyre Co., or their representatives or servants, or any fellow competitor.

11. The aeroplane shall at all times be at the risk in all respects of the competitor, who shall be deemed by entry to agree to waive all claim for injury either to himself or his aeroplane, or his employees or workmen, and to assume all liability for damage to third parties or their property, and to indemnify the Royal Aero Club and the Michelin Tyre Co. in respect thereof.

12. The Royal Aero Club reserves itself the right to add to, amend, or omit any of these rules should it think fit.

Gordon-Bennett Aviation Cup.

The cup having been won by a representative of the Aero Club of America, the race for 1912 will take place in the United States. The exact time and place will be announced later.

At the recent Conference of the Fédération Aéronautique Internationale in Rome, it was decided that the course is to be a closed circuit with a minimum of 5 kilometres, and the total distance to be flown is 200 kilometres.

Each club affiliated to the Fédération Aéronautique Internationale has the right to challenge the holder, the Aero Club of America, and such challenge must be sent in before March 1st, 1912.

The Committee of the Royal Aero Club will select the three competitors to represent the British Empire, and intending candidates are requested to notify the Secretary on or before February 15th, 1912, of their willingness to compete, if chosen. Applications must be accompanied by a cheque for £20, the entry fee, which amount will be returned should the entrant not be selected.

Balloon Ascents.

In August last Mr. A. Mortimer Singer offered a Cup to be awarded to the member making the largest number of balloon ascents between September 1st and December 31st, 1911. Members who have made ascents during this period are requested to send a list of such ascents to the Club not later than Tuesday, the 9th inst.

166, Piccadilly. HAROLD E. PERRIN, Secretary.

FROM THE BRITISH FLYING GROUNDS.

Brcoklands Aerodrome.

ON Wednesday, last week, Lieut. Spencer Grey was at work on his Blackburn, which, after covering several circuits, he took up to over 1,000 ft. At the Avro School, Setti and Graves (a new pupil, better known as "Darracq" of looping-the-loop fame), were both practising on the Green-engined machine. Lieut. Parke, R.N., came over and took out the Viale-Avro, which he flew over Addlestone at a considerable height.

On Thursday, Spencer Grey was again out on the Blackburn doing some well-banked circuits in a gusty wind, also Setti and Graves.

On Friday, Setti was on the Green-engined Avro for a short while, and Gill put in some rolling practice on the school Deperdussin. Garne made an attempt to pass the second half of his *brevet* on the Bristol. Finding that the engine was not pulling well he came down, and after making an inspection Fleming took it up to assure himself that everything was right. Garne then accomplished several figures of eight, but on the fifth turn found that the machine wanted to climb more than he liked, and as he was then on a right-hand turn, his attempt to make her drop her nose by turning to the left spoilt the figure. He did not go up again, but Fleming took Nesham out for instruction in lever-control. Later Naval Cadet Wheeler went out on the same machine and flew about a dozen circuits at over 2,000 ft. Fleming was up with Lieut. Smith, Capt. Raleigh, Nesham and Lane as passengers at various times during the day.

Saturday was an excellent flying-day, and there was a fair attendance of visitors, considering the time of year. Gill did hops on the school Deperdussin, seeming to have a pretty good idea of handling the controls. Setti flew two circuits on the Green-Avro, and Parke took out the other Avro, with the intention of passing the altitude and landing tests for his superior *brevet*. Making the machine climb rapidly, he made off over Addlestone, and soon reached well over 1,000 ft., being occasionally lost to view in some comparatively low-lying clouds. He came down well, *en vol plané*, and his landing, which, however, was decidedly bumpy, brought him within the prescribed distance from his observers, thus being the first Naval officer to pass the height test.

After lunch Sopwith was up first on the Martin-Handasyde, which machine he flew almost continuously till dark, taking numerous passengers. It flies splendidly, but the extent to which Sopwith trusts it is not always pleasant to watch. Blondeau, on his biplane, cleverly avoided what might have been a close shave. When only a short distance from the ground he was confronted by another machine which had just landed. Elevating quickly, he put on a tremendous "bank," and got clear in a most masterly fashion. Lieut. Hewlett afterwards was out on the same machine. Spencer flew his biplane as usual at various intervals during the afternoon. Parke again had out the Viale-Avro, and circled the aerodrome for some time. Setti and Sabelli were practising on the Avro and Deperdussin respectively. Pashley tried his Humber-Blériot, but as it did not seem by any means satisfactory, the propeller was changed. By this time, however, it was nearly dark, so flying was discontinued.

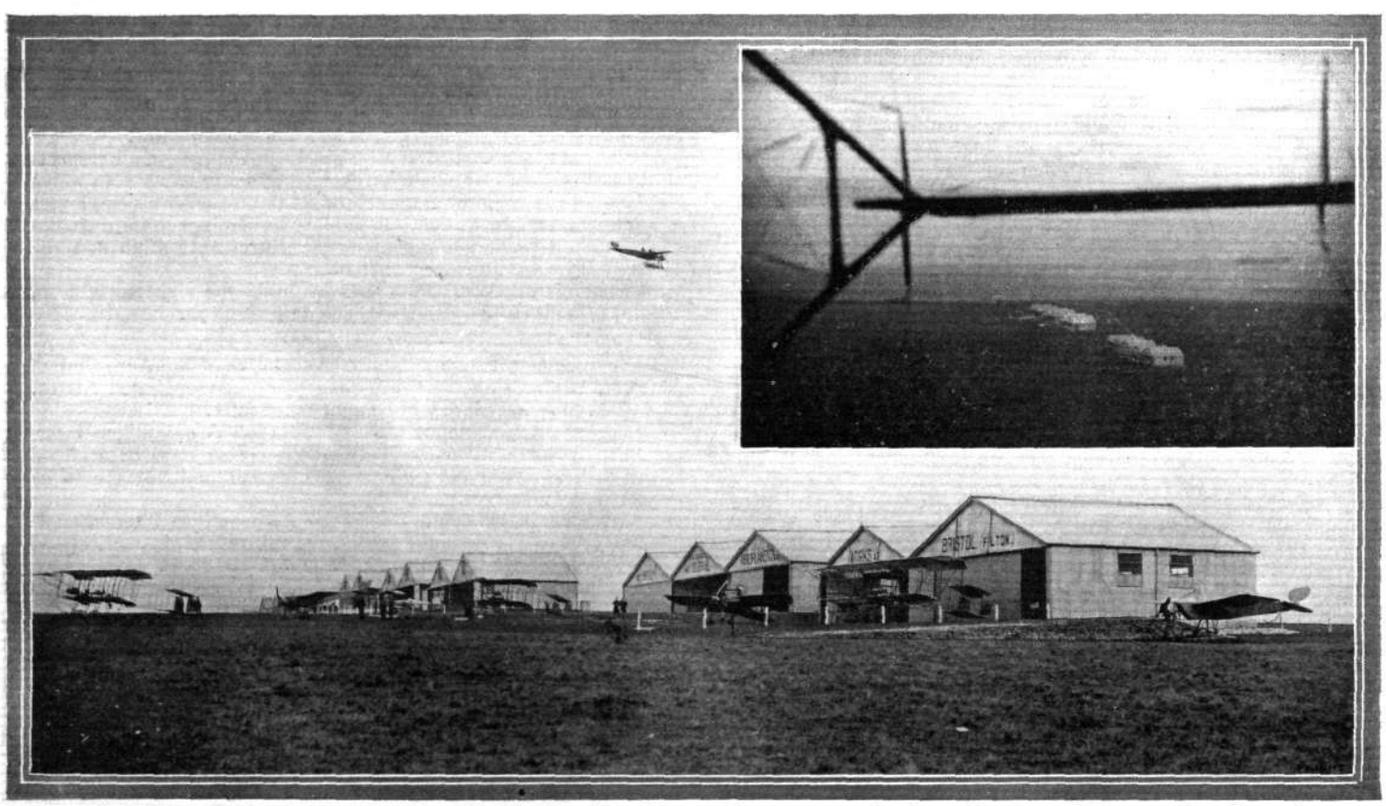
At the Bristol School, Fleming took Lieut. Smith up for three circuits, then the latter did some short straight flights. After landing with a bump, he found himself in the air again, but prevented any damage by switching the engine on again, which brought the machine to earth in safety.

In the afternoon, Fleming was up with Lieuts. Stephen and Nesham, allowing them lever-control. Gordon-England then made a flight on same machine. Captain Raleigh was doing straight lines, his landings being greatly improved.

On Sunday, Sopwith started off for St. Albans on the Martin-Handasyde. We hear later that on arriving there he landed in a small field and being unable to check his speed sufficiently unfortunately ran into a bank, which broke the first skid and the propeller. Spencer and Parke were flying, but Blondeau was unable to do so, as a petrol-can which had been left on one of the planes of his machine flew back into the propeller and smashed it. Gill was out on the Deperdussin, doing short straight flights.

On Monday, Fleming, on the Bristol, was up first, and went over Weybridge at 3,000 ft. When at that altitude his engine failed him, forcing him to come down in a spiral *vol plané*. Users of Gnome engines here, by the way, have all experienced trouble the last few days, apparently due to atmospheric conditions. Fleming then took Smith and Nesham out in passenger's seat for practice in lever control. S. V. Sippe took out the Viale-Avro, flying well for nearly three-quarters of an hour, doing the required number of eights at about 300 ft., but he landed too far from the observers. He went up again, and landed right among the observers from about a 300 ft. *vol plané*. Setti was up on the Green-Avro, and Blondeau was flying his biplane. In the afternoon Fleming was flying with Warren, Nesham, and Smith.

On Tuesday, Sippe flew the Viale-Avro in excellent style for some time, then finding his engine was not doing its duty he came down again. When this was remedied he found that the wind had got up, and was blowing treacherously, so left off for the day. Grahame



FROM *TERRA FIRMA* AND FROM ON HIGH.—The "Bristol" aviation schools at Salisbury Plain, with a Bristol two-seater monoplane in flight; and inset is a view of the same scene from a Bristol biplane.

Wood put in some circuits on the Hewlett-Blondeau machine, while Gill practised on the Deperdussin. Fleming on a Bristol with Smith as passenger did two circuits. Warren went for a straight flight, during which, for some reason, he switched off and pancaked, luckily without damage to landing-chassis. Fleming then took him up again as passenger, followed by Smith and Lane.

Brighton-Shoreham Aerodrome.

LAST week-end has seen the successful completion of two machines—the Collyer-England tractor biplane and the Chanter monoplane. The first-named made straight flights on Saturday and Monday, with Dowland in control, and was put through a fair amount of rolling by both England and Dowland. Mr. M. Chanter took his new monoplane out on Monday, and was in the air with her shortly after leaving the shed. On Tuesday, she was out again, under the pilotage of her owner, and gave still better results. Ross, Gassler, Kent and Davies, were out on the Chanter school Blériots.

London Aerodrome, Collindale Avenue, Hendon.

Grahame-White School.—Last Saturday saw the return of Clement Gresswell, who has been recuperating in Devon since his strenuous work in connection with the Aerial Post. He was out on the School Farman No. 3 for a couple of circuits, prior to taking up a lady passenger for a ten-minute flight.

On Monday of this week, the weather had so improved that quite a number of the pupils turned up and had good practice ; amongst them being a new-comer, H. C. Biard, who has been gaining useful experience in the assembling of engines, &c., in the workshops, as could easily be seen by the manner in which, from the first, he grasped the main points of control ; and he looks like becoming a very proficient aviator. Gates was also out, and put up some very fine steady straight flights with excellently judged landings. Raphaite was practising rolling and appears to be getting much more certain of his controls.

Again on Tuesday much practice was put in and Biard indulged in some really good rolling, being in full control of the 50-h.p. Gnome-engined machine.

Ewen School.—At the W. H. Ewen School things are assuming a very business-like appearance. A very useful supply of spares is being stocked for both Deperdussin and Blériot machines. On Saturday, M. Paul Dubois joined the school and had his first lesson. Last Wednesday Mr. Ewen made a splendid flight on his 28-h.p. Deperdussin, passing round by Edgeware and Millhill. At a height of 300 ft. he shut off the engine, and made a beautiful glide which extended from one end of the aerodrome to the other. Again on Saturday Mr. Ewen made a short flight for the benefit of some intending pupils.

Salisbury Plain.

Air Battalion.—On Wednesday of last week, Barrington Kennett was out on the Nieuport monoplane and made a twenty-five minutes' flight, mostly at a height of 1,000 ft. Capt. Fulton was also up on the Bristol military biplane and finished a very good trial by a spiral *vol plané* from a height of 900 ft., Lieut. Reynolds likewise putting in some useful scouting practice on a Bristol biplane. On Thursday owing to bad weather there was no flying, but plenty of work was done in the hangars. There was a welcome change in the weather on Friday, however, and Barrington Kennett was again the first out, making several good flights on the Nieuport machine. Capt. Fulton and Lieut. Reynolds were also in the air on the Bristol biplane, the latter going for a thirty minute jaunt round Bulford Camp, Amesbury and Stonehenge. Lieut. Reynolds also made some passenger flights during the afternoon. A distinguished visitor was General Altham, who was greatly interested in the flying. Mr. Cockburn was busily testing the engine of his new biplane. On Saturday, Lieut. Reynolds put in some high flying practice, but was greatly hampered by the fog, which prevented him getting much higher than 800 ft. Capt. Fulton was also flying around the camp, and on Sunday he made his first flight in the Bristol single-seater monoplane. The machine behaved splendidly under his guidance, and apparently gave the greatest satisfaction. Lieut. Conner was up to a height of 2,000 ft. on the Bristol extension biplane, and glided down from that height with his engine shut off. Capt. Fulton and Lieut. Conner were also on their Bristol biplanes on Tuesday.

Bristol School.—The usual activity of the Bristol Schools was resumed on Friday last week, when in the afternoon a test flight was made by Mr. Jullerot, who decided that the weather was too rough and treacherous to commence tuition flights.

On Saturday the weather was more favourable to flying, and all the pupils who had by now returned to the school were taken for passenger flights, Lieut. Murray, the last pupil to join the school, receiving six lessons. Lieut. Bower, who has again taken up residence at Salisbury Plain, this time for tuition on the monoplane, went for a trip on the school monoplane.

The weather conditions proving more favourable for flying practice and tuition on the Sunday, it was decided to open the school on that day. Work commenced in the morning, and was continued during the afternoon, Lieut. Murray again having a number of passenger flights. Although this pupil only joined the Bristol school within the last few days, his progress has been so rapid that he will be making solo flights over the Plain during the coming week. Lieut. Borton then took one of the Bristol biplanes, and twice made a circular flight over the neighbouring village of Bulford. Mr. Bendall afterwards piloted the machine for half an hour, when he made a beautiful flight, which made it certain that yet another name would soon be added to the already large list of Bristol certificated pilots. Three solo flights were made in the afternoon on the school monoplane, including one by Capt. Fulton, of the Air Battalion.

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NEW ARMY AIRCRAFT FACTORY AEROPLANE.

THE painstaking but very energetic research that progresses at the Army Aircraft Factory, under the superintendence of Mr. Mervyn O'Gorman, has resulted in another experimental aeroplane taking the air. The machine—from what we are allowed to see of it at the polite distance of a spectator among the casual public that frequents the Plain on the " off chance "—is a large biplane with an absolutely silent engine. It has been said that it is a remodelled version of the Duke of Westminster's old Voisin, but it seemed to us that there was more remodelling than anything else, and everything that one could see about the machine was of singular interest. In the control, the entire wing surfaces seem to be warped, which appears to give exceedingly powerful balancing action for the maintenance of lateral equilibrium. The detail construction also gives evidence of extreme care, and the application of the principle of streamline form together with the complete absence of visible rigging wires in the tail are both points worthy of comment. The engine is evidently a Wolseley, and has the propeller in front. A rough guess at the speed would place this figure at about 60 m.p.h. The gliding angle seems to be very fine too, as far as one can judge of these things by the eye. The propeller is of the four-bladed type ; and, apart from the silence of the power-plant, another feature of especial importance is the fact that the engine can be started from on board. Mr. G. de Haviland has been acting as pilot with great success, and among the passengers has been the superintendent of the factory, whose object in this aeroplane construction work, it may be as well to emphasize once more, is research, not competitive manufacture. In fact, we believe the inclination of the officials is to give British constructors who are building military machines access to the information obtained by means of this research work.

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Spirited Contest for Coupe Femina.

THE closing days of the Old Year saw a keen duel between Mdlle. Helene Dutrieu and Mdme. Jane Herveu for the Coupe Femina, which was held during the year, with a record of 167·2 kiloms. Mdme. Herveu had been practising under Legagneux's guidance on a Blériot monoplane at Compiegne, and on the 28th ult. she covered 97 kiloms. in 1h. 4m. 50s., then having to come down owing to rain, while on the 30th she covered 151 kiloms. in 1h. 44m. 23s., only to be brought down by a broken petrol pipe. Her best performance was on the last day of the Old Year, when 248 kiloms. (154 miles) were covered in 2 hrs. 41 mins. This, however was not sufficient to win the cup. At the same time Mlle. Dutrieu was flying on her Farman biplane at Etampes, and covered 254·12 kiloms. (158¾ miles) in 2 hrs. 58 mins., and this, for the third time, secured the prize for her. On the previous day she made a flight of 140 kiloms.

The Ae.C.F. Criterium.

ALTHOUGH several determined attempts were made, no one succeeded in beating the record of 740·255 kiloms. covered by Gobe on his Nieuport in 8 hrs. 16 secs., and so he is the winner of the Aero Club of France Criterium. On the 30th, Moineau, on a Breguet, had a try, but after covering 300 kilometres was forced down by the weather. Tabuteau, on his Morane, and Gobe on a Nieuport, both intended to have another go at Pau on the last day of the year, but were prevented by the bad weather, whilst Fischer, on his Farman biplane, at Bouy, in an attempt, only covered 140 kilometres, when he had to land.

AIR EDDIES.

WHY is it that pupils of flying schools seem so keen on effecting a double-barrelled name as soon as they get their tickets awarded them? This is a subject that has worried me for some considerable time, and the only reason that I can suggest is that the action of joining the surname by means of a hyphen to the Christian name immediately preceding it is thought by some to lend a certain amount of *réclame* to their otherwise common-place styles. No doubt the idea originated because Grahame-White, who is a pretty sound man to copy on most things, especially in piloting, boasts, and always has done, a name of this *genre*. As a sort of parallel case, it was quite funny to observe at the various meetings of the year before last, that when Grahame-White came down to fly arrayed in a glorious pair of check riding breeches, lounge coat, smart bow, and brown shoes, nearly all his acquaintances turned up later in exactly the same guise.

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Dear me, how fast we progress these days. From Manchester emanates an idea of constructing an aeroplane so that it can be converted at will into a neat little two-storey cottage. Exactly what commercial future lies before an aeroplone that fulfils the double purpose of mansion and machine, is somewhat difficult to see. There is, no doubt, some fantastic interest in the prospect of being able to glide down on to some nice healthy gravel site at the close of a long day's flying, and set off again in the morning after having transformed the machine from hearth and home to petrol and plane. The idea really originates from one who has produced quite a useful clinometer for use on aeroplanes. Well, there are moments——

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During the past week somewhat of a record has been achieved by one of our British pilots, that is, the honour of being engaged as pilot to one of the biggest constructors in France. As far as I am aware, this is the first time on record that a French firm has acquired the services of an English pilot to demonstrate their machines, and, consequently, much credit is due to Gordon Bell, who has done much good work at Brooklands on the Deperdussin machine, and to the R.E.P. firm, the former for having achieved something decidedly original in the annals of aviation, and the latter for their ability to recognise a really good pilot. He is at present at Buc, where he is getting his initial experience of the machine. As soon as that is completed, it is his intention to fly from Paris to Pau, *via* Bordeaux, accompanied by a passenger.

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Living a bit off the line of active life undoubtedly narrows the views of folk. Recently I had a newspaper sent me from the north of Scotland which had, as a subtitle to a paragraph on the proposed War Office tests, "Huge prizes offered." Whether or not this is the general opinion held by those in that part of the world I do not know, but of this I am sure, that if it is, this opinion is not shared by us southerners. But perhaps the originator of the headline is a descendant of the famous "Bang went saxpence!" northerner.

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The Blackburn two-seater at Brooklands has really been giving a very good account of itself under the pilotage of both Lieut. Gray and B. C. Hucks. After only a short experience at rolling and hopping, Lieut. Grey, who had previously done all his flying on a biplane, got the machine into the air and circled round the track for about half an hour. On coming down he fairly shook hands with himself, as Blackburn puts it, out of sheer enthusiasm. Certainly the Blackburn monoplane, with its distinctive control, seems to be an eminently easy one to master, as, later on in the day, Lieut. Grey, after so short an acquaintance with it, took the machine up to over 1,000 ft. At the same time, we must not lose sight at its pilot's undoubted ability at flying.

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As a result of the encouragement that has been given to the British aviation industry, by reason of the interest that the War Office is beginning to take in the matter, it is quite likely that we shall see other engineering firms following the example of Vickers, Ltd., in taking up the design and manufacture of aeroplanes. Rumour has it that Messrs. Denny, of Dumbarton, and the Armstrong-Whitworth people are shortly going to branch out in this direction.

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It would be difficult to imagine a country where an aerial mail scheme would be more advantageous than in South Africa. To E. F. Driver, who with Compton Paterson, is engaged on an exhibition tour, belongs the credit of having inaugurated the first aeroplane delivery of letters in that part of the Empire, on Wednesday, of last week, by flying in his Blériot monoplane with a load of correspondence from Kenilworth to False Bay.

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After the various projects that have from time to time been put forward, with a view to crossing the Atlantic by means of dirigible balloons, proposals to perform a similar feat by aeroplane are beginning to take concrete form. Last week there was James V. Martin, who is busy over here in England making preparations for a trans-Atlantic flight; this week comes the news that Atwood has a similar project in view. Who will come forward with the same idea next week? One at a time, please!

"OISEAU BLEU."

ELECTROPLATING OF NON-METALS.

A VERY interesting and very important process in electro-chemistry, with vast possibilities, has been introduced by the Harvey Electro-Chemical Co., of Norfolk House, Laurence Pountney Hill, E.C., the purpose of which is, principally, to electroplate non-metallic substances. Hitherto a metal deposit on china or glass is made either by first coating that surface with a suitable preparation of black lead and electrolytically depositing the metal thereon, or else by burning what may be described as a metal paint on to the surface, as in the case of lustre ware. In the former process the plumbago base, or whatever else is used, forms a layer between the metal and the china or glass, which can be stripped off bodily after it has been deposited, and cannot, therefore, be really termed secure against the exigencies of rough usage. In the other case the deposit is so extraordinarily thin that the greatest care has to be taken in polishing it, and, ordinarily, it will soon be worn off.

By the new process, which is just now attracting so much attention, an electro deposit is made direct on the surface, which is previously prepared in such a way that the metal adheres to the molecular structure of the base. Take china, for example, the glaze is eaten off in an acid bath containing metal in solution, and the metal in the solution is precipitated on the wetted surface after the object has been removed from the bath. This precipitation is obtained in a variety of ways, one of which is to scratch the surface with a revolving metal brush, the action of which sets up electro-chemical reaction between the metal in solution and the wire bristles, of such a kind as to bring about the desired result. Having been brushed in this way, the molecules of the roughened surface of the china are already coated with metal, and the remaining process of electro deposition merely builds up a suitable thickness of metal on this foundation.

The process is applicable to china, glass, and wood, all of which an be coated with copper, silver, or gold, or practically any other etal or alloy that is capable of being electrolytically deposited at all. A quantity of household articles are already being manufactured by this means, and they are not only much cheaper but are found to be much more satisfactory than the other methods. The silver bands on water pitchers, for example, are now being made in this way, and there is a great field for its application to delicate glass instruments that are liable to be broken.

The process is, of course, equally applicable to the deposit of metal on metal, and it seems as if this really does offer a satisfactory solution to that hitherto insoluble problem of soldering aluminium. By this process, an aluminium surface can have a deposit of any suitable metal made upon it, which in turn can form a base upon which to solder. Aluminium trays, for example, could be tinned, and lugs, beads and bosses could be soldered thereon. Radiator tubes for aeroplanes might be made of aluminium with tinned ends, which would enable them to be joined together. Crank-chambers for marine motors could be of aluminium with brass plating, and the spokes and bosses of steering wheels on motor cars might, for special work, be given a deposit of silver. Aluminium could doubtless be used for lamp construction by the present system, and it may be that there are several jobs in automobile carriage construction to which it can be usefully applied. A metal deposit on a timber panel, for example, might be useful, as also the plating of iron stanchions that are used to support the roofs of limousines.

The galvanising of bolts is another interesting example of its utility, and be sure the threads of the bolts are not clogged by this process as in the ordinary way, nor is there any question of high temperature affecting the metal.

In aeroplane construction there is the possibility of metal-plating the propeller, which will render it less liable to split, and it might also be very useful to be able to put metal ferrules on timber struts. One way and another, therefore, it would seem as if there were a great future before the Harvey Electro-Chemical Co. in their new undertaking.

BRITISH NOTES OF THE WEEK.

A Good Flight at Eastbourne.

MAKING his test for the Royal Aero Club certificate, Mr. F. B. Fowler, at Eastbourne, on December 27th made five figure eights during 17 minutes at an average height of 200 feet, and then landed within 2 yards of the centre of the circle of 50 yards. The machine was a 50-h.p. Gnome-Blériot.

A Model Club for Eastbourne.

IT is proposed to establish a model aero club for Eastbourne and district. In order that a start may be made with the arrangements, anyone interested in the project is asked to send their name to Mr. V. Yates, St. Antony Avenue, Seaside, Eastbourne.

A Lecture for Youngsters.

UNDER the auspices of the Young Aerial League a lecture is to be given at the Passmore Edwards Hall, Tavistock Place, W.C., on Saturday next 13th inst., by the President, Col. H. S. Massey the subject being "How Men Fly." Members and Boy Scouts in uniform will be admitted free, while the charge for non-members is sixpence and for parents and grown-ups eighteenpence.

An Aero Club for Edinburgh.

IT is proposed to form an Aero Club in Edinburgh, and all interested are invited to write to D. Urquart, 127, Lothian Road, Edinburgh, who is acting as honorary secretary *pro tem.* The club will have the advantage of the use of a glider which has been successfully tested, and therefore operations can be started at once.

Mrs. Lilian Bland's Biplane and Accessories.

MRS. BLAND asks us to state in reply to the shoal of letters received by her as a result of the paragraph in our issue of December 23rd, that she has now arranged to present her biplane glider to the newly-formed Dublin Flying Club. Mrs. Bland regrets, owing to the large number of letters she is still receiving, she cannot reply personally to her correspondents. All the accessories are also disposed of, with the exception of the Aeroplane engine, which is still open for negotiation.

Engagement of Lord Howard de Walden.

THE congratulations of all motorists—aerial, terrestrial and aquatic—have been showered upon Lord Howard de Walden, whose engagement to Miss Margherita Van Raalte was announced last week. Lord Howard de Walden, as is well known, has been an enthusiastic and liberal supporter of both motoring—and aviation—in all its branches, and, although he has been unable to find much time for flying, he is the possessor of an aeroplane.

Record Balloon Voyage.

IN a balloon piloted by Mr. C. F. Pollock, the Hon. Mrs. Assheton Harbord accomplished, on Friday of last week, what is, we believe, a record point-to-point trip in England. Leaving Pembroke Dock Gasworks at 2.50 a.m., the balloon, aided by a westerly wind, was carried to Witham, in Essex, where a descent was made at 1.40 p.m., the distance of 240 miles having been made in ten minutes under the eleven hours. The Hon. Mrs. Assheton Harbord was competing for the Royal Aero Club Challenge Cup, which she had previously won twice in succession.

A clever up-to-date "Arabian Nights" Christmas greeting from Mr. C. Cliff Cheek.

A Plane Talk.

Scene: Three men and a piece of rough wood.

BILL (a Warwickshire man): "'ow can I smooth this 'ere piece o' wood?"

JOHN (a Yorkshireman): "Try plane."

BILL: "I ain't got ere a plane."

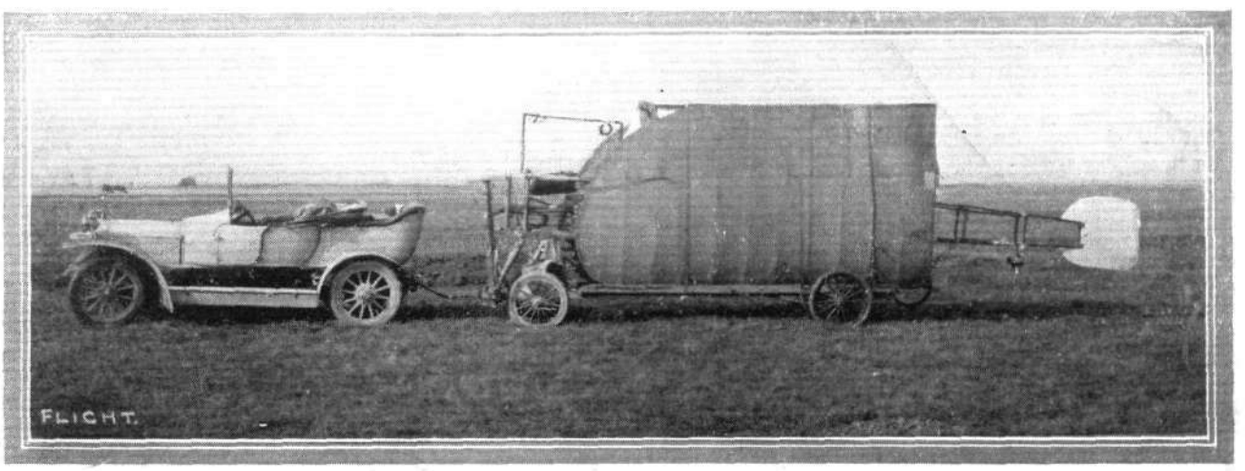
JOHN: "Well, buy plane."

'ARRY (also Warwickshire): "W'y dan't yer lend the mon a plane."—BEN KELSEY, of Water Orton.

An Ingenious Aeroplane Trolley.

IN the accompanying photograph is seen the method employed by the Eastbourne Aviation Co. for conveying their machines by road. The trolley was specially constructed by them for the purpose, and consists of the front and back wheels of an ancient Oldsmobile, fixed to an ash framing made of 3 in. by 2 in. timber. The under-carriage of the machine is firmly bolted to this framing, and the wings are carried in a felt-lined trough fixed on either side. A tow-bar of the usual type is used to attach the trolley to the car.

The aeroplane, a 25 h.p. Anzani-Blériot, seen on the trolley in our photograph, had just come a distance of 110 miles, over which an average speed of 15 m.p.h. was maintained. The total length of the car and trolley when the machine is mounted on it, is about 43 ft., but we understand that no difficulty was experienced, even in negotiating right-angle corners.



The special trolley which has been devised by the Eastbourne Aviation Co. for the purpose of conveying their aeroplanes by road, and for use as a breakdown vehicle.

FOREIGN AVIATION NEWS.

Latham Goes to the Congo.

HAVING received a permit from the French Colonial Office, Hubert Latham has proceeded to the French Congo in order to take part in some big game expeditions on the Ubhangi River. Incidentally, he intends to study the possibilities of aviation in the French Colonies, and for this purpose has taken a monoplane with him.

New Year's Honours for French Military Aviators.

IN the list of French Military Honours published on New Year's Day appears the name of Sergeant Sommer, Corporal Aubrun, Sapper Renaux, and Captain Godart of the Army Reserve, who have been made Chevaliers of the Legion of Honour. On the active list, Lieut. Maillefer, Lieut. Malherbe, Captain Echeman, Lieut. Vence, and Captain Delassuf, are also announced as Chevaliers of the Legion of Honour, while a large number of military pilots have been put forward for promotion.

The Air Force at Tripoli.

THE Italian military aviators and aeronauts at Tripoli have had a serious setback owing to the very severe storm which prevailed on the 16th and 17th ult., as a result of which one of the dirigibles, from which much had been hoped, was so seriously damaged that it will probably have to be sent back to Italy for repairs. It appears that one of the great hangars that had been built was blown down on the top of one of the airships, "P 2," which had just been got ready for inflating, and the car was very badly buckled and damaged, although the envelope only suffered slightly. The other dirigible, "P 3," escaped injury, but the Italian army are without a sheltered place in which to erect it. The number of aeroplanes at the front has now grown to 22, 9 of which are at Tripoli, 5 at Derna, 4 at Zobrouck, and 4 at Benghasi. The pilots at Zobrouck are volunteers, including Cagne, Ruggeroni, Rossi, and Re.

Morin among the Trees.

WHILE passing over the woods at Artix during his first attempt for the French Superior Certificate over a course from Pau to Peyrehorade and back. Morin had trouble with his motor and had to come down among the trees. Fortunately, however, he escaped unhurt.

Mdme. Hanriot Flies With Her Son.

ON Monday at Rheims, Marcel Hanriot took his mother for a lengthy trip, at a height of 800 metres, while Hanriot *père* also made a passenger flight, taking his mechanic for a jaunt over the Bethany Plain.

An Aviator in a Duel.

OWING, it is said, to a political misunderstanding, a duel was fought on Sunday, at Paris, between M. Fournel, a deputy, and M. Fabry, well known as a racing motor driver and also as an aeroplane pilot. The deputy was wounded in the fourth bout, but insisted on continuing, and was wounded again in the sixth bout when the contest was then brought to a close, rather more damage than usual in French duels having been inflicted on both combatants.

Col. Bouttieaux in the Air.

ON the 28th ult., Col. Bouttieaux made a special visit to Chalons Camp, in order to have a look at the new biplane with hood for military use, which has been built by Mr. Henry Farman. In the afternoon, Col. Bouttieaux was taken for several demonstration flights with Mr. Farman, and spent quite a long time discussing details of the new machine.

Japanese Mission at Villacoublay.

ON the 29th ult., members of the Japanese Imperial Mission paid a visit to Villacoublay, and witnessed some flights made by Labouret on one of the new Astra-type C biplanes. Afterwards three members of the mission were carried for a flight.

The Toulon Meeting.

THIS meeting, which started on the 23rd ult., was sadly spoilt by bad weather, although practically every day some sort of a flight was made by one or other of the aviators engaged. During the first few days flights were made by Brindejonc des Moulinais on his Morane monoplane, while on the 29th Laurens was also up on a Deperdussin, as also was Dancourt on a Blériot. On the 29th ult. Brindejonc des Moulinais started from Toulon and flew over to Nice, making a stop at Frejus on the way. From Nice he proposed to go on by way of the air to visit his parents at St. Laurent du Var. On one or two days Guillemart also made several flights on a Nieuport. On Sunday, Brindejonc des Moulinais flew back from Nice to Toulon in 1 hr. 25 mins.

Flying Home from the Military Competition.

SEVERAL of the competitors in the Military Competition had already flown their machines home from Rheims, when, on the 29th ult., Frantz, on the Savary, with a passenger, and Verrier, on a Farman, set out to fly home, the former to Chartres and the latter to Juvisy. They travelled by way of the air in company to Beauvais Park, at Meau, where they spent the night, and then departed in different directions to their respective destinations.

Fast Flying on Sommer.

LEAVING Mourmelon on a Sommer monoplane on the 31st ult., Bathiat flew *via* Rheims, Mezieres, and Sedan, and landed at Douzy, after having covered 150 kiloms. in 1 hr. 5 min.

An Aerodrome for Belgian Military Pilots.

IT is reported that the Belgian Military Authorities have decided to acquire the Ans Aerodrome, so that they may have a flying ground for military pilots in the zone round the Meux Forts.

German Automatic Stability Monoplane.

ON the 26th ult., at Johannistahl, a Dutch flyer, Fokkar, was testing a monoplane, fitted with automatic stability, without wings warping, the machine appearing to, in a measure, justify its inventor's claims.

An Austrian Lady Flyer.

AUSTRIA promises soon to have a capable lady pilot, as Fraulein Lily Steinschneider has been making some excellent flights on her monoplane at the Weiner Neustadt flying ground, and should very shortly qualify for her certificate.

Another Trans-Atlantic Flight Promised.

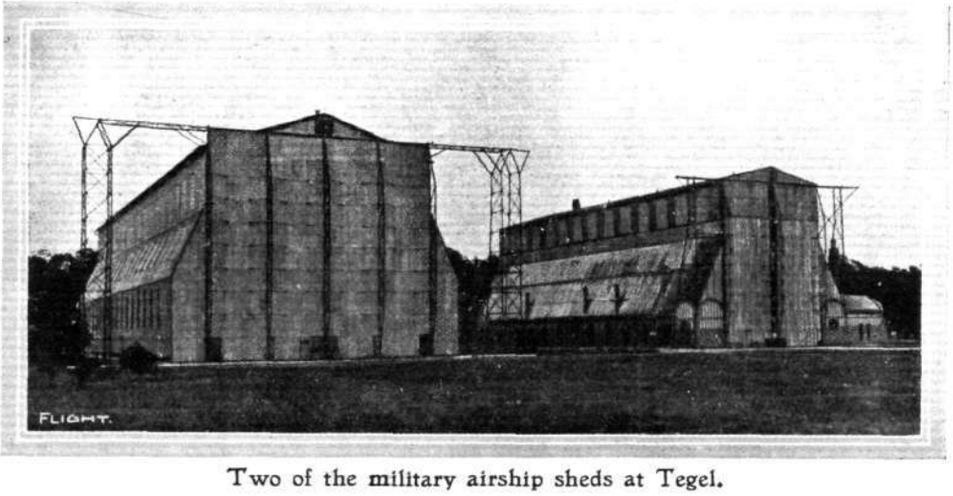
IT is reported from New York that Harry N. Attwood is now taking definite steps with a view to making an attempt to fly across the Atlantic during next April. He has ordered an improved hydro-aeroplane, and proposes to start from Newfoundland, and hopes to accomplish the trip to the Irish Coast in thirty hours.

An American Benevolent Fund.

THE Aeronauts Fund Association has been incorporated at Albany, N.Y., with the object of helping disabled aviators and making grants to widows and orphans in the case of fatal accidents. Among the prime movers are "Bud" Mars, Walter Brookins, Capt. Baldwin, and Arnold Kruckman, the latter being also the acting secretary. Two benefit performances have already been arranged in New York theatres, and a number of pilots have offered to give their services at a big meet to be held in the early summer.

Flying in Ceylon.

THE first flight in Ceylon was seen on Christmas Day, when Franz Oster made some trips over the racecourse at Colombo. Unfortunately while ending the last one the machine fell from a height of 68 feet, but the aviator escaped practically uninjured.



Two of the military airship sheds at Tegel.

FLIGHT

AEROPLANE EFFICIENCY.*

EFFICIENCY in an aeroplane, as in any other machine, is the determining factor in its capacity to do big work on a limited supply of fuel. Long journeys and flights of extended duration are limited by this, quite apart from any consideration as to the stability of the machine, the skill of the pilot, or the behaviour of the weather.

From land to land across the Atlantic Ocean, the shortest distance is some 1,700 miles, which would occupy about 28 hours on a machine averaging 60 miles an hour. Fuel is being consumed during the whole of this time at a minimum rate of ·65 pints of petrol per horse-power hour, whence at least (28 × ·65 = 18·2) pints would be needed for every horse-power developed by the engine employed. This quantity would weigh, for petrol of ·7 specific gravity, approximately 15 lbs.

In flight, an engine works at full power all the time, so there is no discount on the above figure when it is multiplied by the power of the engine in order to obtain the total quantity of fuel consumed.

The engine itself would weigh at least 3 lbs. per horse-power, whence the power plant alone represents (15 + 3 = 18 lbs.) per horse-power as a minimum for the journey. The engine that would carry itself across the Atlantic must therefore, be capable of supporting 18 lbs., in flight at 60 miles per hour, per horse-power developed.

One horse-power is equivalent to 6·3 lbs. thrust at 60 miles per hour, and the ratio 6·3 to 18 = ·35, represents the minimum thrust-lift ratio, "efficiency," or, as I prefer to call it, "coefficient of flight," for this imaginary system in which the power-plant is supposed to be flying without wings or propeller.

Directly the aeroplane and pilot are introduced into the calculation, this minimum value is altered considerably, for however light you may conceive it possible to build a machine, the man, at any rate, will weigh 150 lbs. if he is a normal specimen of humanity. This weight and the weight of the machine are fixed quantities, and their influence on the efficiency factor is greater the smaller the engine, for the more powerful the motor the less per horse-power is the increment that they represent.

For example, suppose the aeroplane and the pilot weigh 1,000 lbs. while the engine is 100-h.p.; their increment represents 10 lbs. per horse-power to the absolute minimum of 18 lbs. per horse-power in flight at 60 miles per hour, and thereby alters the coefficient of flight to ·225.

Alternatively, if only 50-h.p. is employed, the efficiency ratio is raised to 38 lbs. per horse-power, which is equivalent to a coefficient of flight of ·166. Thus, the less powerful the engine the more efficient must be the aeroplane as a whole, consequently *the chances* of building a machine that will do the job *increase with the power* of the engine, provided always that such an engine is itself as economical and light per horse-power as one of lower power.

The extra total weight of fuel required for the larger engine only effects the question in so far as it may adversely influence the design of the aeroplane proper, on which, of course, it must be carried. So far as it represents dead weight, it is proportional to the power developed, and, therefore, it is immaterial whether there is much of it or little.

If there is a difference in fuel economy between one engine and another, the length of the journey determines whether this difference is important or not, for the effective difference in weight per horse-power brought about thereby is ascertained by multiplying the difference in the rate of fuel consumption by *time*.

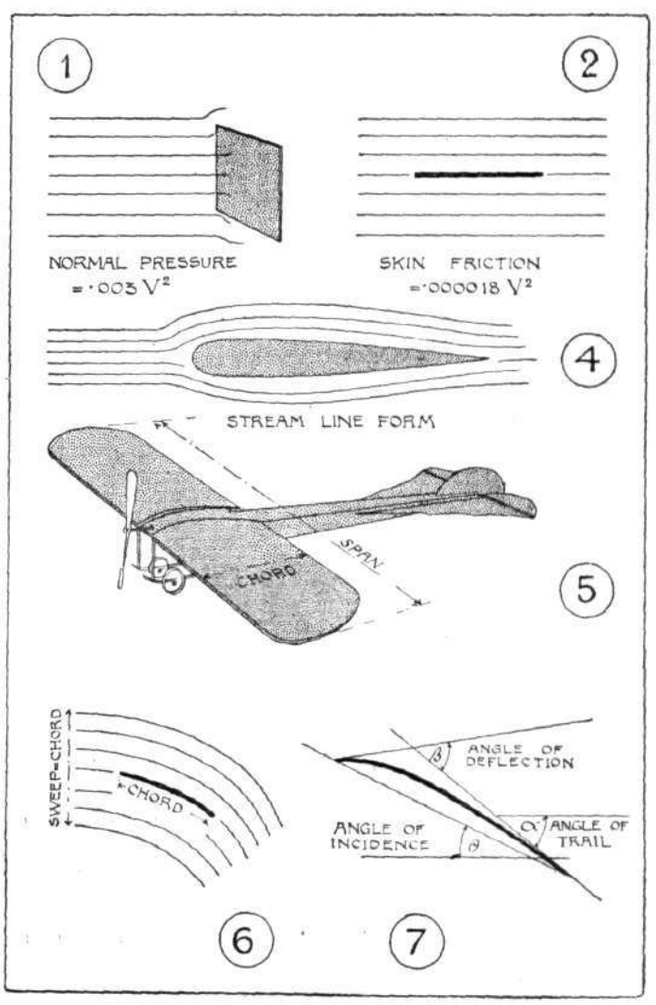
If, on the other hand, the difference between two engines is solely one of weight per horse-power, then the effective importance is uninfluenced by the nature of the flight. Also it is generally small by comparison with the increment represented by the weight of the aeroplane and pilot, as explained above. For example, if the engine weighed 4 lbs. per horse-power, instead of 3 lbs. per horse-power, this would only mean a difference of 1 lb. per horse-power, whereas the aeroplane and pilot represent an increment of at least 5 lbs. per horse-power with a 100-h.p. engine.

For the sake of argument, let us assume that the engine develops 100-h.p. and works under the above conditions. It will require (100 × 15 = 1,500) lbs. of fuel for the journey. This quantity of petrol would occupy (at 43·4 lbs. per cubic foot) nearly 35 cubic feet, and could be carried in a cylindrical tank 2·5 ft. in diameter by 7 ft. long. This investigation is important; it shows whether it is practicable to carry the initial quantity of fuel that must be put on board before the start of a long flight. Also it is some indication as to the strength and size of the aeroplane that would be required to carry the fuel in addition to the pilot and any other extra load.

It should interest those who have not previously studied this aspect of flight to observe that some fairly tangible conception of the problem is afforded by such a simple application of first principles in mechanics. None of the above deductions have been founded on any special knowledge of the laws of flight; it is simply and purely an armchair analysis of the fundamental situation, for all that has been done is to say what the coefficient of flight must be if a certain weight is to be sustained at a certain speed by a certain power.

As the conception of a self-supported mass in continuous horizontal motion is not elsewhere presented by any ordinary problem in mechanical science, it often happens that even the trained mind fails to appreciate this fundamental simplicity of the case. When a definite weight is known to be supported in horizontal motion at a definite speed by the exertion of an engine of definite power, then these very data themselves establish the ratio of thrust to lift that is the measure of an aeroplane's "efficiency," which I have otherwise expressed by the more appropriate term "coefficient of flight."

To know that a certain coefficient of flight is obtainable is one thing, to know how to obtain it is another. Investigation of this side of the question leads on to a study of resistance to motion through the air and the lift of a wing in flight.



* Paper read by A. E. Berriman, Technical Editor of FLIGHT, before the Royal Society of Arts, on November 29th, 1911.

First, as to resistance generally. This is primarily of two kinds; in one part it is due to normal pressure caused by the wind striking against the face of a flat surface (Fig. 1), in the other it is due to "skin friction" caused by the wind rubbing against the sides of a plate that is moving edge on (Fig. 2).

Dr. Stanton, of the National Physical Laboratory, also various other authorities, have experimentally established an accepted formula for such normal pressure resistance in the expression $R = \cdot 003\ V^2$, where R is in lbs. per square foot of area facing the wind and V is in miles per hour.

In America, Dr. A. F. Zahm has experimentally provided a formula that has not been generally accepted, although one of the few that exist, in the expression $R = \cdot 000316V^{1\cdot85}l^{0\cdot93}$ (where R = resistance of double surface per foot of span, l = chord of surface). This formula may be approximated for aeroplane wings, within the ordinary limits of modern flight speeds, by the simplified expression $R = \cdot 000018V^2$ (Fig. 3). And, as the expression itself is in doubt, there is little object in being particular as to accuracy in detail at the moment. In this expression, R represents the resistance per unit of *double* surface moving as a plate edge on to the wind. When the surfaces are separated, as in the formation of a box or casing, where they would be measured separately, the coefficient in the above formula is halved to make it applicable to the single surface or external area.

The important point to observe is that the relationship between skin friction and normal pressure is represented by the ratio of 1 to, approximately, 300. In other words, you may use 300 square feet of edge on surface to enclose 1 square foot of normal area, if you can ensure that this covering body is truly edge on in effect.

Bodies of streamline form (Fig. 4), as understood in naval architecture and in fluid dynamics generally, are supposed to convert normal pressure into skin friction; they, therefore, potentially are capable of reducing resistance within the limits indicated by the above figures. This always assumes of course, that Zahm's coefficient is approximately representative of the true state of affairs. If it is not, then the substitution of a more accurate value will immediately show the corresponding limits of possible gain.

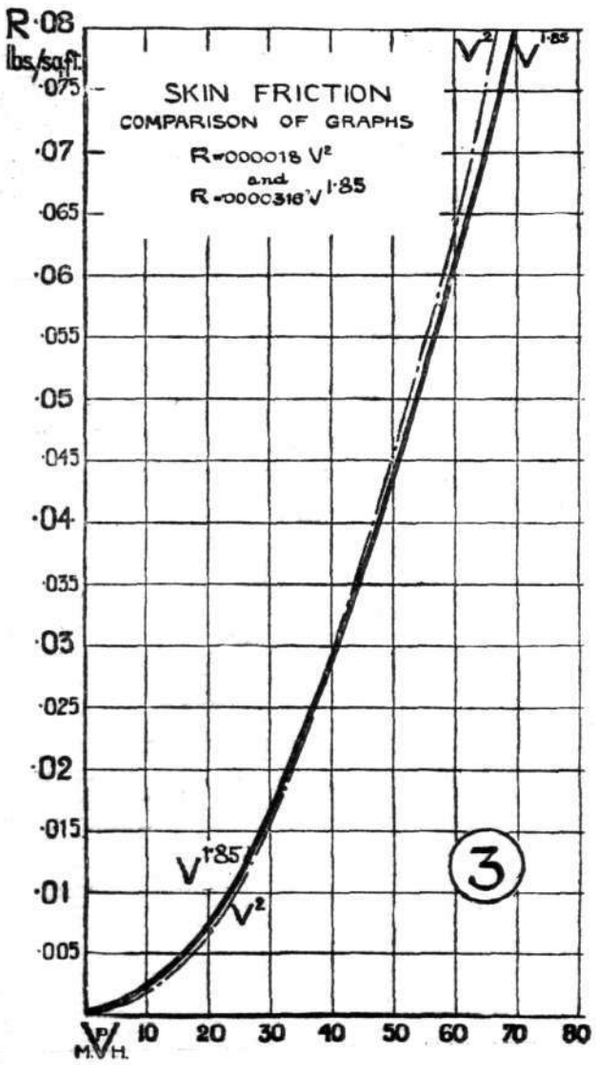
In any case, these figures at least suggest the importance of eliminating normal pressure from aeroplane design, by the use of bodies of streamline form to enclose the larger masses on the machine.

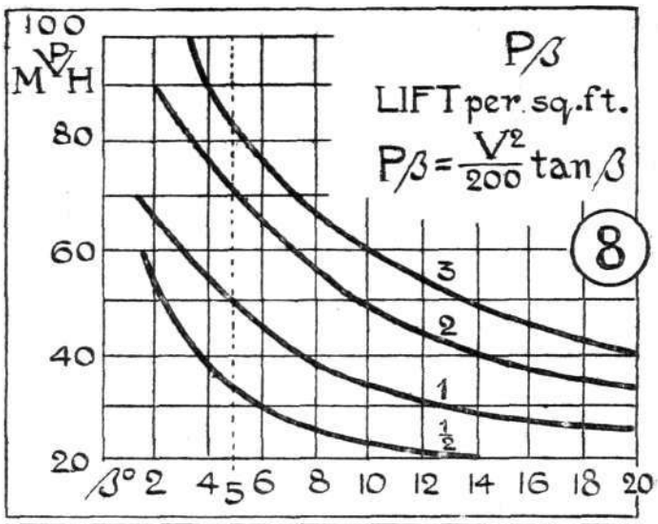
This body resistance—in which is included the resistance of the struts, wires, and all framework except that actually forming the wings—is a resistance that is proportionate to the square of velocity (according to the above expression) and is a kind of extra dead load on the machine. It bears no relationship to the lift of the wings, and is, consequently, a detriment to efficiency. It is very important to discriminate thus between body resistance and the resistance of the wings.

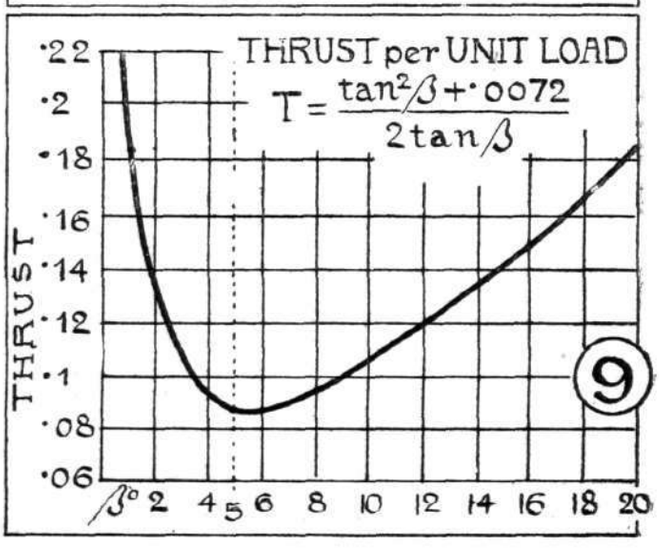
The resistance of an aeroplane wing in flight is itself of two kinds, one being the above-discussed skin friction of the surfaces, while the other is a dynamic resistance due to the creation of the aerial wave that supports the machine in flight.

This latter we may call the resistance due to load, and it will be shown that it is a function of the effective angle of the plane. If the effective angle is reduced, the resistance due to load *per unit of supporting area* will be decreased, but in order to support the same total load the area itself must be increased, which in turn increases the resistance due to skin friction.

Hence there is a relationship between the two kinds of resistance experienced by a wing in flight, which is why the wing needs to be considered separately, and why it is not proper to include the wing surface with the body surface when calculating the skin friction resistance of the machine as a whole.







If Zahm's expression for skin friction is accepted, we may pass on to consider the resistance due to load. It is more convenient, as an intermediate step, first to find an expression for the lifting power itself.

On the hypothesis that an aeroplane is supported in flight by the inertia of the air, it becomes possible to apply the fundamental equation $P = mf$ (where P = lifting force and m is the mass under acceleration f).

In order to apply this fundamental formula, it is necessary to find plausible expressions for the mass of air simultaneously disturbed by the wing in flight, and also an expression for the acceleration induced in that mass.

As to the mass itself, it is obviously limited in two dimensions by the span and chord of the wing (Fig. 5). Its third dimension, which corresponds to the depth of the stratum disturbed, is supposed to be a function of the chord (Fig. 6), and to have a coefficient in the order of unity. Whence we may write mass in the form ($\rho L l l = \rho A l$), (where ρ = density, A = wing area, L = span, and l = chord).

Next comes the question of acceleration, which, from the very nature of the function of a wing, is determined by flight velocity and angle.

What is the effective angle of a wing?

Some say θ, the angle of incidence, some believe in the angle of trail a, but I submit that the angle of deflection β is the most plausible measurement (Fig. 7). It is immaterial, however, what angle is taken if the assumption be that the air stratum itself is deflected to the assumed degree.

Assuming that the angle of deflection as defined in Fig. 7 correctly represents the actual deflection of the air stratum, and that the camber of the wing is such as to produce uniform downward acceleration in each air molecule, then the final downward velocity with which a molecule leaves the trailing edge is represented by the expression ($V \tan \beta$) and the rate of acceleration itself by the expression

$$\left\{ (V \tan \beta \div \frac{l}{V} \right\} = V^2 \tan \beta / l)$$

(where V = feet per second).

Thus, we have established plausible expressions for mass and acceleration, and their product should give a value for the lift or upward force of the wing in flight. Combining these expressions in multiplication, it will first be observed that the chord factor (l) cancels out of the expression, and since the area factor (A) may be removed by working in units of a square foot, or other convenient measure, we are left with an expression in the order of ($\rho V^2 \tan \beta$). This, put into practical units for $\left(\frac{\rho}{g} = \frac{1}{400}\right)$ and (V = miles per hour), evolves the following definite formula for the lift of an aeroplane wing in flight $P\beta \frac{V^2 \tan \beta}{200}$.

The graph of this expression is given in Fig. 8.

The next step is to find an expression for the resistance due to load, which involves the assumption that this resistance is confined to the apparent energy in the deflected air stratum. Energy is represented by the fundamental expression ($\frac{1}{2}mv^2$), and we have already evolved expressions for mass (m) and downward velocity (v).

Of these : $m = \frac{\rho}{g} A l = \frac{A l}{400}$, and $v = V \tan \beta$, whence

$\frac{1}{2} mv^2 = \frac{V^2 \tan^2 \beta l}{800}$ foot lbs. per square foot of wing area.

Now this energy per square foot is dissipated $\left(\frac{V}{l}\right)$ times per second; hence the power expended on load may be expressed $\frac{V^3 \tan^2 \beta l}{800 l}$ foot lbs. per second per square foot which may be converted to resistance by dividing by (V), whence, resistance due to load is $\left(\frac{V^2 \tan^2 \beta}{400}\right)$ lbs. per square foot. (V is in miles per hour.)

The other part of the resistance to the flight of the wing is skin friction $R = .000018 V^2$, whence the total resistance

$$= \frac{V^2(.000018 + \tan^2 \beta)}{400}.$$

Having evolved expressions for lift and resistance, their ratio gives the coefficient of flight for the wings alone. Thus

$$V^2\left(\frac{\tan^2 \beta}{400} + .000018\right)\left(\frac{200}{V^2 \tan \beta}\right) = \left(\frac{\tan^2 \beta + .0072}{2 \tan \beta}\right).$$

The graph of this expression is given in Fig. 9.

Now, what do these graphs show? That illustrating the coefficient of flight is particularly interesting, for it indicates that coefficient varies with the angle of the plane, is independent of velocity, and has a minimum value in the order of .085 for an angle of deflection of 5°.

These numerical values result from the assumed coefficient for skin friction and the density of the air; the principle of an angle of least resistance to flight is unaffected by their variation. That the coefficient is independent of velocity is due to the absolute resistance and the absolute lift of a wing both being proportional to V^2. If the speed is doubled, the lift is quadrupled, and so is the resistance; their ratio is unchanged. It follows, therefore, that the most efficient variable speed machine is one having a variable area rather than a variable angle. Also, that for a fixed area and weight there is a natural flight speed.

Since speed does not affect the coefficient, it follows that, from the point of view of the *wings alone*, the speed should be suited to the use of an angle of least resistance. In the graph, a very flat camber is indicated, which implies a very high flight velocity to attain the loading of the wings that is common practice to-day. It is in respect to the very heavy loading (weight supported per unit of area) of their wings that aeroplanes differ from birds, which have proportionately far larger wings than have flying machines.

In the construction of monoplane wings, larger areas imply greater spans and, consequently, involve the use of a greater weight of material per unit of area in order to retain the same strength. Thus, the net lift of the wings per unit of area diminishes in large sizes, whence there are good grounds for the general principle that a heavy monoplane must fly fast in order to use efficient wings.

From the point of view of body resistance, a very high flight velocity is wasteful of power, but the magnitude of the loss depends on the efficacy of streamline bodies to reduce resistance. In practice, cambers representing far higher angles than that indicated as possessing least resistance are used, in order that machines of small area may rise at moderate speeds.

So the significance of efficiency as a governing factor in long distance flights has been discussed, and a method of mathematical analysis has been suggested. This latter, I wish to say, is intended primarily as an elementary line of thought for students, analogous to presenting the problem of the steam engine in the time-worn formula (PLAN/33000). It does not pretend to be either scientifically complete, nor is it based on practice. It is just a skeleton framework of theory intended to help those who have the concrete bricks of fact to make most use of them in building the houses of experience wherein a practical science can only abide.

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Airships Over Paris.

WITH a crew of thirteen passengers on board, the dirigible "Adjutant Reau" was cruising for some time over Paris on the last day of the old year. This made the third successive day on which an airship had been seen over the Grand Palais. On the previous day the "Capitaine Ferber" had passed over, while on the 29th the "Adjutant Vinceneau" passed over Paris during a four-hour run starting from and finishing at Toul.

"Capitaine Ferber" Out Again.

PILOTED by Count de la Vaulx, the Zodiac dirigible "Capitaine Ferber" was out on the 27th ult., and, after making a long excursion to the west of Paris, circled over the Grand Palais before returning to its headquarters at St. Cyr.

"Parseval XI" Taken Home by Road.

AS there seemed no possibility of better weather being obtained to enable "Parseval XI" to get home from her enforced resting-place at Trebbin, it was decided on the 26th ult. to deflate the airship and send it back to Bitterfeld by road.

More Capital for Zeppelins.

IN view of the further orders to be given out by the Army Authorities, it is announced that the Zeppelin Construction Co. will shortly increase its capital from one to four million marks.

Models

Conducted by V. E. JOHNSON, M.A.

The Weight of the Model and the Length or Duration of Flight.

AT an aero-model competition held at the Crystal Palace in August, 1910, at which there were no less than sixty-three competitors, in class I (1 sq. ft. surface area or under) the longest flight was 212 yards; in class II (over 1 sq. ft. but less than 2) it was 150 yards; in class III (over 2 sq. ft. but under 4) it was 128 yards; in class IV (over 4 sq. ft. but under 8) only 109 feet. At another competition held at the same place in June, 1911, for duration the winner's time was 46 secs. Weight of model about 4 ozs., but another model, disqualified for being considerably under weight, accomplished a duration of 61 secs. The above results are merely taken at random, and much similar evidence could be brought forward to show that apparently a weight (and therefore size within limits also) lying between 2½ to 4½ ozs. is the best. The smaller the model (within limits) the longer the flight both in distance and duration. We also know of a 1-oz. model which has flown 542 yards and which has a duration of 72 secs. This is not stated in any sense as being a record for this weight of model. When we turn to heavier models as stated in a recent issue a 21-oz. model has flown 300 yards. The writer has a model, weight 22 ozs., which has flown about the same distance. As long ago as July 17th, 1909, a Clarke's flyer weighing 20 ozs., flew 400 ft. Flight velocity about 40 ft. per sec. But we believe we are correct in stating that such models have flown well over 1,000 ft. A 10-oz. model has, we believe, flown a quarter of a mile.

On Aug. 12th, Gamage Challenge Cup, a 4-oz. model flew 1,681 ft. 10½ ins. It was, however, assisted by fairly high wind. As stated in last week's issue a 2¼-oz. model has flown 2,265 ft. None of the results given are intended as *records*. The question which arises then is why is the smaller and lighter model so superior to the heavier and larger type? Admitting that such is the case, with respect to which we shall be pleased to hear from correspondents more especially *re* distance and duration records of models from 6 to 8 ozs. up to a pound or so in weight; why is it? Before stating our own views on the matter we invite our readers to send us their opinions. So far as our own personal observation went, competitors last year who turned up at meetings with large machines were, practically speaking, not in it. Was it constructional faults or faults in the design of their machines, or had they really handicapped themselves unawares? Is there some relation which must hold, say between dimensions and flight speed not present in their design? Or is the action of the wind sufficient to account for such discrepancies; being far more powerful (in proportion) in the case of light models than heavier ones, or is it because such a speciality has been made of one type of model? We await what our correspondents have to say on the matter with considerable interest.

In giving particulars of any flight kindly state *both* weight of model and size, *i.e.*, span and length; also wind conditions if known.

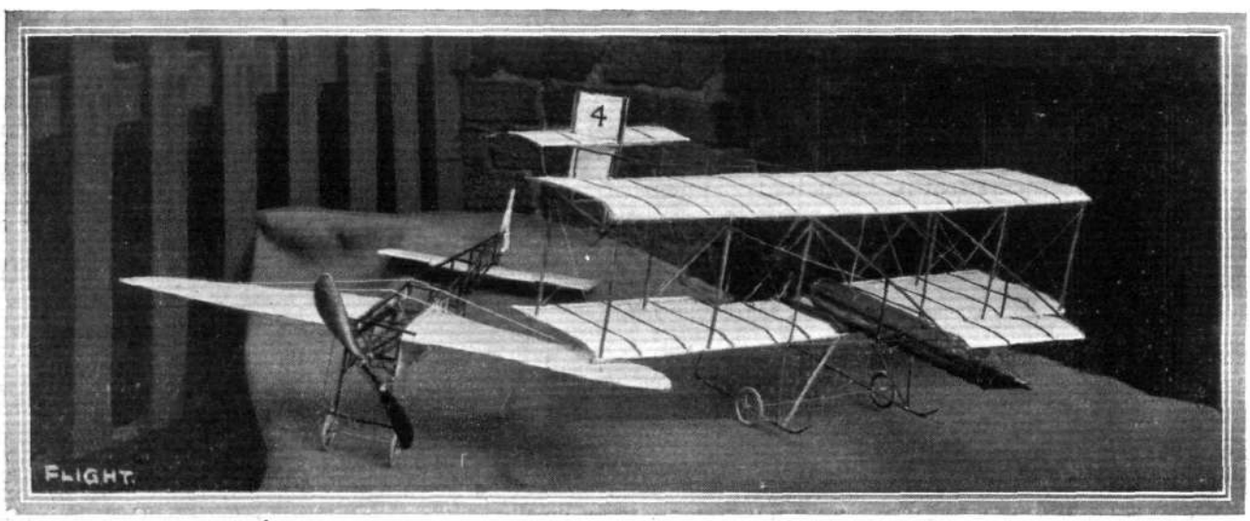
The above has reference to models launched by hand and not to self-rising models. Supposing for the sake of argument that for hand launched models a 4-oz. model gave the best result—then for a self-rising one the weight would be in excess of this by at least 1 to 2 ozs.

The most interesting feature of the whole case in our opinion is this—is it or is it not *solely* a case of proper design and skill in construction or is it *something else*?

Replies in Brief.

N. V. BRASNETT.—Personally we always place the axes of the propellers perpendicular to the base strut and not parallel to the two sides of the isosceles triangular framework. In the latter case as you say *some* power is undoubtedly lost—if the angle be a very small one probably it is hardly worth considering; in the former there is some extra friction but in the case of a good bearing this seems to be the lesser of the two evils. As to any difference of power exerted by the rubber in the two cases, in practice we should assess it as nil. The bearing should either be a double one or possess a certain length—such as is given by a piece of fine tubing when the axis is perpendicular to the base strut.

H. S. MELHUISH.—The difficulty with respect to the elastic motor that you have met with in building a scale model Farman biplane owing to want of requisite length is quite a common one. The best and easiest way is to depart a little from the exact type and place your propeller in front of the main planes. The same being fitted on to a motor rod running right to the tail of the machine (if so desired). This should be attached to the frame in guides so that the whole—propeller, motor rod and rubber—can be moved backwards and forwards for adjustment purposes. In order to balance the effect of a single propeller—place it not exactly in the centre of the plane form of the machine but *slightly* to one side. For the motor rod—use a T shaped piece of *well seasoned* pitch pine or a well made paper tube, the rubber motor being of course inside it, varnish when finished. Six layers of thin tough paper should suffice. Plug the ends with wood to carry the bearings. If you desire to retain the propeller in its proper place, *i.e.*, behind the main planes, then your best plan is to make the axis of the propeller of wire with a hook on either side, *i.e.*, on both the front and rear side of the propeller (the bearing being on the most convenient side), and use two skeins of rubber, one running from one hook to the end of the elevator support and the other to the end of the tail support; you will thus have a motor the entire length of your fuselage, 2 ft. 9 ins., with the propeller approximately in the middle. Here, again, it would be better to depart from the original and employ twin propellers. Of the two systems suggested, the first is the better, if anything like good flights are desired. You have no other possible form of motor at your disposal in such a small model, 3 ft. span by 2 ft. 9 ins. length; total weight, 1⅜ lbs. The weight is very great, with a supporting area of only slightly over 3 sq. ft., you will need a velocity of 19 to 20 m.p.h., which we are afraid you will find very difficult to obtain.



MR. C. HEMIN'S BLÉRIOT AND HOWARD WRIGHT MODELS.—The latter is fitted with a compressed-air motor with which some good flights have been obtained.

H. S. SADLER.—You will find what you require in "Flying and some of its Mysteries," Chapter IX.

WALLIS SHERLEY-PRICE.—It is impossible to answer your questions without further information *re* area of supporting surfaces, full particulars as to rubber motor, pitch of propeller, and general dimensions of your model. The vibration of the untwisting rubber motor would not cause the results you state, but *an unbalanced propeller* might have something to do with it. Ball bearings are no advantage on small models, whatever they may be on very large ones—rather the reverse. It looks as if your machine were underpowered.

S. CLARKE.—With respect to your queries concerning "propellers," you will find them all fully (much more fully than we could possibly deal with them here) answered in "The Theory and Practice of Model Aeroplaning," Chapter V.

P. BRYANT (MELBOURNE).—In constructing a long-distance flyer, the length of your central stick or motor rod should be at least twice the span of your main plane. You must use twin propellers, carefully and accurately tuned to give exactly the same thrust, or your model will circle. These propellers should, of course, be of opposite pitch. Your supporting surface should not possess more than medium area. In the drawing you enclose your dihedral angle is far too large—the slightest angle should be enough—upturned tips are probably better. Your elevator is also much too large, see December 16th issue. No, half an inch is not thick enough; try three-quarters to an inch. You will find your other queries (not already answered here or in back numbers, which please consult) dealt with in future issues.

L. G. RYLEY.—To get your model to fly straight you must first carefully adjust and tune up your propellers so that they give exactly the same thrust. Test them at the extremities of a horizontal arm carefully balanced and pivoted about its centre, so as to turn about a vertical axis, using same *weight* and *disposition* of rubber for each motor. Wind both up equally and release at same instant; if each gives the same thrust there will be no rotation, if one gives a greater thrust than the other there will be rotation. Apply two tests at least, interchanging propellers to make sure—carefully tune up your propellers, re-pitch blade area, &c., until there is no rotation, *i.e.*, until the thrusts exactly balance. Then try again on your model—carefully noticing if it exactly balances laterally—if the distance of your bearings is exactly the same from the centre of the plan-form of your machine—if the *weight* of your two rubber motors is the same, &c., &c., no fin or rudder *per se* will make your model *fly straight*—a rudder is to steer by. A vertical fin is preferable (for stability purposes) behind than in front. We should not advise you to use one—at any rate, try first the method we have suggested.

For carving propellers from the solid, the formula you give: $P = 3\frac{1}{7} \times D \times \frac{l}{w}$. Where P = pitch and D diameter of propeller, and l and w thickness and width of block before cutting is generally regarded as reliable. The tip of the propeller-blade running diagonally across the end section of the block.

REGINALD OATES.—We will propose dealing with the model hydro-aeroplane later on. In the meantime you can easily try a few experiments. Make your floats as light as possible, and give them a fish shape somewhat blunt nosed, but with finely-tapered stem, and fix them to your model (presumably), so that their centre of gravity is slightly behind the centre of gravity of the rest of the model. Do not lower your centre of gravity any more than you can help. Judging from the very poor performance of the model you name at the Wakefield competition for self-rising models, you would be quite unable to do as you suggest. In any case you will probably have to considerably increase your power.

ROBERT H. HARRISON.—We have not received your communication. Write again, and enclose stamped and addressed envelope, and we will reply as you suggest.

PROGRESS OF FLIGHT ABOUT THE COUNTRY.

NOTE.—Addresses, temporary or permanent, follow in each case the names of the clubs, where communications of our readers can be addressed direct to the Secretary. We would ask Club Secretaries in future to see that the notes regarding their Clubs reach the Editor of FLIGHT, 44, St. Martin's Lane, London, W.C., by first post Tuesday at latest.

MODEL CLUBS.

Aero-Models Assoc. (N. Branch) (15, HIGHGATE AVENUE, N.).

A VERY enjoyable meeting was held at the above address on the 23rd ult., there being a good turn out of members. Mr. R. G. Corder kindly brought along several cards of samples of Clarke's model accessories, which provided considerable interest, as close inspection of the articles was thus afforded. There were also some models and model propellers to be seen, which were not, however, put under test in the room, though interesting experiments were carried out with a paper plane, constructed by Mr. Brosse, and which closely resembled the Gamage "Curva."

On Boxing morning, the secretary, Mr. Ross, paid a visit to Palmer's Green, and despite the rain, spent quite a good morning's sport at the hands of the Palmer's Green Model Club, where some good flights were put up.

Another social is to be held at 15, Highgate Avenue, N., on Saturday, January 13th, at 7 p.m. Will every member try and turn up and bring anything of interest in the model aeroplane line with him. Model competition on January 20th. Full particulars next week.

Joint secretary with Mr. M. B. Ross is Mr. H. Brosse, 9, Clifton Road, Crouch End, N.

Birmingham Model Ae.C. (8, FREDERICK ROAD, EDGBASTON).

AT Billesley Farm there has not been a busy appearance during the holidays, no doubt this being due to the weather. There was, however, a slight improvement this week-end, both in the model flying and in the attendance. Mr. E. Trykle, who has not lately done any record flights, showed an improvement, sometimes getting flights of about 300 yards. Towards the end of the afternoon there were several other models brought out. Mr. M. Vale was flying a converted monoplane, this once being a biplane, and obtained some very satisfactory flights. Mr. W. Lunn was again getting some excellent results, and towards dusk gave an exhibition of gliding with his model from the roof of the shed. A large number of fine glides were obtained, the model's gliding angle being over 1 in 7. A little of Mr. G. Haddon Wood's old flying was again seen, his model had, however, the peculiarity of taking the course of the letter S. This could only be attributed to the elastic giving off an uneven torque. The flying of Master Stamp's was as good as has been seen for several weeks, his flights finishing with splendid glides. A monoplane having a high aspect ratio, built by Mr. A. F. McManus, was doing plenty of fast flights of about 1,000 ft. A search for this model after the last flight of the day had to be made owing to its having outpaced its constructor, and losing itself in the dark, but it was eventually found at a spot a long way from where it was assumed to have dropped.

Blackheath Aero Club (196, BROCKLEY ROAD, BROCKLEY, S.E.).

ON December 25th and 26th many members were experimenting at the Kidbrooke and Lee grounds, and Messrs. Dollittle, Whitworth, and Brough were competing for the rose-bowl presented for the longest straight flight with a "tractor" model.

The result was in favour of Mr. Dollittle, who made a flight of 318 ft. with his original Gnat monoplane, as illustrated in FLIGHT last week. The perfect stability of this tractor has to be seen to be appreciated.

On Saturday last, at Kidbrooke, Mr. C. Ford obtained his second-class certificate with a good flight of 287 yards, and Mr. L. Brough, flying a new 4-oz. Victor monoplane on Blackheath, gained his first-class "ticket" with an excellent flight of 1,524 ft. The model was not aided in any way by a wind, as a dead calm prevailed at this moment.

Messrs. Collins, Egelstaff, Woollard, and Waghorn were also flying at Kidbrooke, and Messrs. Clark, Whitworth, Dollittle, Packham, and Pizey were at Lee, and Mr. F. Plummer easily gained his second-class certificate with a large "Meteor" mono. Mr. Plummer's model attained high altitudes, and was greatly admired for its steady flying.

The following new members were elected:—Mr. G. Brown, of New Cross; Messrs. F. Clarke and E. Hock, of Crofton Park; Mr. S. Martin, of Lewisham; Mr. G. A. Morley, Woolwich; and Mr. F. Packham, of Chislehurst. The committee expect many additions to the membership list as a result of the club's first exhibition, which will have been held by the time these notes appear, and the Secretary will be pleased to supply full particulars to anyone making written application to the above address.

On Saturday, January 13th, there will be open competitions at Kidbrooke for "distance," "duration," and "steering," and 15 marks will be given for the two former events, and 20 marks for "steering," and Mr. J. H. Dollittle will present a small silver cup to the constructor of the model which gains the highest total number of marks. Flying will commence as soon as possible after 2 p.m.,

and intending competitors who have not previously visited the B.Ae.C.'s Kidbrooke ground should refer to the October 28th, 1911, issue of FLIGHT, where they will find a map and full instructions how to reach this ground.

During this week-end the usual flying experiments will take place at Kidbrooke, Lee and Blackheath.

At the last-named place Mr. A. B. Clark hopes to test his new biplane, which will be fitted with wheels and floats, to enable this model to rise from land and water under its own power.

Bootle and District Aero Club (late Liverpool Model Aero Club) (39, BROOK ROAD, BOOTLE).

AFTER some weeks of enforced inactivity, Saturday last saw some splendid flying on the club ground, notably by Messrs. Harley, Ledward and Huntington. Harley's model was of unusual type (0-1-p2-1), and easily captured the club records for both height and speed. The tail in flight had a negative angle of incidence. Ledward flew a "baby" and a Mann type machine. Huntington is coming right to the front rank, and his flying on Saturday was a wonderful improvement on his last attempt. Pugh's "Cathedral," appears very much underpowered, and unable to do anything over 300 feet. Stephens had a huge machine out, but the plane was obviously too small to support it.

There will be a discussion on Monday, January 8th, at 7.30, when the Secretary will read a paper on the progress and aims of the club since its formation to the end of 1911. Prospective members are earnestly invited to attend.

Messrs. Malins are getting along well with their glider, and hope to have it ready for assembling very shortly, when members of the club will be called in to work on the real thing.

We wish all the clubs a season of great prosperity, and look for co-operation, as suggested by Mr. O. Hamilton, Jun., of the Stony Stratford K. and M.A.C.

Brighton and District Model Ae.C. (36, LITTLE PRESTON ST.).

SATURDAY last saw an excellent afternoon's flying at Brighton-Shoreham Aerodrome. Bate, as usual, turned up with a selection of exquisitely-built models. He obtained some magnificent flights. One of his models with two planes set tandem, one just behind the other, flew quite well. Several visitors were intensely interested in his beautiful 12-inch "baby," which flew small circles at about 20 ft. Wichmann put up just over 400 yards, narrowly missing quarter mile. Club measures its flights with 100 yard (tested) reels of thread. Armstrong with "Dunne" type monoplane, twin-propellers, did short flights. How this model flies with no angle of incidence, and no varying camber, seems a mystery. Hervey several times did 300 yards with "Mann." This machine will circle and fly out of ground. White, who makes paper gliders, and then produces model on same lines, flew very weird combination of most things. Knowles was tuning up a ½-oz. model, which proved very fast. Burghope, just back from Warwickshire, flew his giant "'bus." This model, with new motors, scales over 21 ozs., and is loaded 12 ozs. to sq. ft., is now very fast indeed, climbing to somewhere over 100 ft. It is very travel-stained, but does regular 250 yards. One flight was made with a 2-oz. "Teddy Bear" "pilot," this terminating in canal outside aerodrome, after 350 yards flight. Burghope's model, in fifty-one flights, has covered nearly eight miles, without smash. It makes a roar like a Gnome, and does about 25 m.p.h. A French gentleman, very interested, promised to join on seeing Mr. Bate's "baby" do a special flight in the dusk. Flying to-day (6th), Shoreham, and general meeting to-night at 7.45 p.m., at 36, Little Preston Street. Members must take this as only notice of meeting. No more post cards will be sent, so FLIGHT should be obtained first thing on Saturday mornings. Point-to-point competition (open) on January 13th. Quarter milers not necessary, but models must fly straight.

Subscriptions for 1912 are now due. All communications to hon. sec., A. von Wichmann, "Kingsleigh," Kingsway, Hove.

Bristol Model Flying (3, ROYAL YORK CRESCENT, CLIFTON).

AT the meeting held on December 20th, the chairman read the terms of affiliation with the Kite and Model Aeroplane Association. It was decided that no further steps could be taken until formal proposal had been made at Committee meeting of the Bristol and West of England Aero Club to form a model section. All present agreed to join at subscription suggested. The chairman made remarks on "Stability *versus* Efficiency." Messrs. Edgar and Haines spoke on "Landing Chassis" and "British Military Competition."

Model flying on Downs (Sea Walls) every Saturday at 3.15 p.m. until further notice—weather permitting. Model flyers are advised to bring note-books and take notes of experiments.

Conisborough and District Aeroplane Soc. (18, CHURCH ST.).

ON Saturday last, the last flying day of the year, both distance and duration records were handsomely beaten. The record breaker is again Mr. C. C. Allport. The new records are now: distance, 1,163 ft.; duration, 55 seconds. It may be said that these flights were absolutely unassisted by the wind, as it was a dead calm. Measurement was in a straight line from starting to landing point, and the distance covered by the model would be somewhere about 3,000 ft., as it always travelled in a large semi-circle. The duration record was timed as long as the model could be seen, and it was calculated by the distance to have flown several seconds longer. The model showed its merit by repeating the flight several times, one flight being 1,026 ft. and 50 seconds duration. The model was a twin propeller single stick, 4 ft. long, 9 in. propellers of 28 in. pitch, the whole weighing 7 ozs. Messrs. T. S. Wallis and F. E. Greathead were also flying, but both had the misfortune to damage their models before any long flights were made.

Dover and District Model Ae.C. (21, GODWYNE ROAD, DOVER).

THE club held two successful meetings on Wednesday and Saturday last week. At Saturday's meeting there were about twelve models, all of which flew well. The best flights were by Messrs. H. Whorwell, R. C. Wilson, H. D. Davis, H. Holman, McNeille, E. N. Joyce, and A. G. Wicks. Mr. Joyce's model, after a good flight, passed over the spot from which it had been launched, and landed a short distance beyond. At a meeting on Saturday evening, it was decided that the subscription should be 4*s.* per year, and this can be paid in advance to the hon. treasurer, Mr. E. N. Joyce, or in half-yearly instalments of 2*s.* It was suggested that the club should hold an Exhibition some time in February, the exact date and full particulars to be announced later. There is to be a general meeting at 7.15 p.m. to-day (Saturday) after flying.

Hackney and District Ae.C. (47, JENNER RD., STOKE NEWINGTON).

WILL intending members of this club please note that an opening meeting will take place on January 11th, at 7.30 p.m., at 47, Jenner Road, Brooke Road, Clapton, when attendance is cordially invited.

Macclesfield and District Ae.C. (BLAKELOW RD., MACCLESFIELD).

A MEETING of the club, held at St. Peter's Schools, took place on December 21st last, when several members brought their machines, which caused considerable admiration. After several discussions it was proposed that a few experiments should take place with small gliders, several of which showed marked stability and covered fair distances. Also it was decided that members should take FLIGHT and so get information of what the proposed events, &c., of the club are. Any persons wishing to join must please write to C. C. Horner, the hon. sec., as above.

Paddington & Districts Ae.C. (133, BUCHANAN GDNS., HARLESDEN)

ON Saturday last practice flying was indulged in at the club ground, Parkside, Sudbury, Mr. Evans' models being chiefly in evidence, but not flying so well as on previous occasions. Having had a mishap to one of his propellers, he had to substitute a less efficient pair. One model "looped the loop," and nearly came to grief as it terminated its hazardous flight, at a terrific speed, with the propellers mowing the grass until brought to a standstill.

Twenty entries have already been sent in for the competitions for models made in the club workshop, and more than half this number of models are well on the way to completion. The club enrolled two more new members this week, namely, Messrs. C. Dutton and G. Watson. The secretary hopes to make this one of the strongest model aeroplane clubs in the country by next summer.

Palmer's Green and District Model Ae.C. (15, MOFFAT RD., N.).

OWING to a steady downpour of rain on Boxing Day, the competition for distance and duration was postponed. Many members, however, put in an appearance, in spite of the miserable weather, and some good flying was obtained. Mr. M. B. Ross, of Highgate, showed much keenness in turning out, and the club wish to thank him for his surprise visit.

ON Saturday the weather was almost perfect, and many models were brought up to the ground. Mr. E. Brown's Mann monoplane was flying strongly and at great altitudes. We regret to state that it is at present at the top of a high tree, all attempts to rescue it having proved fruitless. Mr. B. Brown was having difficulty with his 4 ft. "liner," although an early morning flight during the week realised 350 yards. Mr. Trollope created a sensation with his new Ridley monoplane, which flew well at first attempt. The first two journeys of the model ended in prickly bushes, and its recovery was accompanied by much remonstrance on the part of its owner. Mr. Reed's model made some good flights, and more attention to detail should produce rapid increase in distance. Messrs. A. and R. Rogers were getting high flights with models of their own design, and the latter was responsible for some fair distances in the straight line.

The fourth official quarter mile flight was made on December 21st in a drizzling rain by Mr. A. O. Rogers with a unique machine of his own pattern. The flight was a high one, two rows of houses being crossed.

A meeting at the usual *rendezvous* in Bowes Parade will be held on Saturday, January 6th, to discuss the New Year programme. Will members please bring models.

Reigate, Redhill and District Aero Club (4, LONDON ROAD).

A DEMONSTRATION was arranged to take place on Boxing Day, but owing to adverse weather conditions had to be abandoned. However, on Christmas Day members turned out with their models, and, in spite of a rather gusty wind, some good flying was witnessed. Mr. W. H. Norton, the club's chairman, brought out his P–1–1 type model (the first in the club), and he is to be congratulated upon building and designing such a stable machine. Mr. A. Lewis was, as usual, getting fine flights with his Weiss-wing model, often obtaining from 200 to 230 yds. Mr. H. Osborne's machine gives promise of being a "goer" when he has fitted a more efficient pair of propellers. Mr. R. Wilson brought out his 1–1–P2 model and succeeded in getting 250 yds., but unfortunately got "smashed up" in the branches of a tree. On Wednesday Mr. Lewis was out again and did several flights of just over 250 yds.; also Mr. M. Wilson had out his "climber" and succeeded in reaching 70 ft., his descents being splendid *vol planés*. Four members have commenced building a glider of somewhat unusual design, and although they are keeping it dark at present, we all hope to be agreeably surprised when it comes to light. The club is now in full swing, and prospective members are requested to apply to H. V. May, hon. sec., 4, London Road, Reigate.

St. Mary's Model Ae.C. (THE VICARAGE, KINGSTON, PORTSMOUTH)

INTEREST centred on the Bros. Restall a fortnight ago. They were out with a 6-ft. Wright type machine, testing it as a glider and some excellent results were obtained. The machine proved to be a very quick riser and should be a success as a power-driven model. Mr. Eburne made some good flights, and Messrs. W. Murray and H. Johnson each had a new machine out tuning up. The meeting was brought to an abrupt close by a very heavy rainstorm.

Owing to the inclement weather conditions on Boxing Day, only a few members turned out. Mr. E. Eburne made several fine flights of about 1,450 ft., and the Brothers Restall had their 6-ft. glider out, but owing to the towing strings snapping the machine sideslipped on to one wing and severely damaged it. On Saturday, Mr. Murray made some good flights with a machine of his own design, and Mr. E. Restall's model rose well from the ground and flew about 240 ft. The next meeting takes place on January 10th, at 8.30, at the Vicarage. Will all members please attend, as some important business will be gone into concerning certificates.

Scottish Ae.S. (Model Aero Club) (6, MCLELLAN ST., GOVAN).

OWING to the holidays there was a very small attendance of members at Ibrox last Saturday. Nevertheless, some splendid flying was seen. Mr. Cameron started well, but later on he unfortunately broke his fuselage, which put a stop to some interesting experiments. Mr. Graham's little model made some very long flights, the speed and altitude of which were far above the average. Mr. Gordon had out his old reconstructed record holder "'Bus," which flew fairly well, considering its dilapidated appearance. In the evening illuminated flying was indulged in by Messrs. Graham and Gordon. On one occasion the sparkler attached to Mr. Gordon's model burnt itself out in mid-air, and some time was spent hunting for the machine in the darkness. Members visiting Ibrox can obtain sparklers at the Bazaar, Copland Road, near Paisley Road. The meeting held at Barrhead on New Year's Day will be reported in next week's issue of FLIGHT. There will be a model flying meeting at Ibrox to-day (Saturday), and also next Saturday, and all interested are invited.

The next lecture will be given in the Institute, Elmbank Crescent, Glasgow, on Friday evening, January 12th, at 8 p.m. The subject is "Propellers," and Messrs. Donaldson and Mills will speak on their experience with different kinds. There will be a discussion afterwards, which promises to be a keen one. All readers of FLIGHT in the district are cordially invited, and there is no obligation to join the club.

Sheffield Model Aero Club (35, PENRHYN ROAD).

THE annual general meeting of the club was held on Dec. 29th, at the Wentworth Café, Pinstone Street. The balance-sheet and the past year's working of the club were read and passed. The following were re-elected for the ensuing year: hon. president, Mr. M. D. Manton; hon. vice-president, Mr. H. Slack; hon. treasurer and hon. secretary, Mr. C. F. W. Cudworth; assistant secretary, Mr. T. Pashley; also a committee. The letter from the Kite and Model Aeroplane Association *re* affiliation was read, and it was decided not to entertain it.

The style and design for printing the subscription cards were brought forward and agreed to. The rules governing the tests for certificates are as follows:—First-class Certificates, 1,200 ft. flight measured in a straight line, 60 secs. duration. The model must be made throughout by competitor *including the* propellers. Second-class Certificate, 750 ft. flight measured in a straight line, 35 secs. duration. The model must be made throughout by competitor, excluding the propellers. That both tests for each certificate must be made in one day. That each competitor be allowed three successive trials on the day. That seven clear days' notice be given to the secretary, so that two observers may be appointed to register particulars in connection therewith.

The members hope in course of a few weeks to get the patronage of local gentlemen. A vote of thanks was passed to the president, secretary and others who had worked hard during the past year in making the club a success.

Smithills (Bolton) Aero Club ("LIEUTENANTS," BOLTON).

SATURDAY was an ideal day for flying, and several models turned out. Some interesting experiments were carried out with a 3 ft. glider of the Farman-type, towing it against a light wind. Later in the day a rising-off-the-ground model was tested successfully, some good flights being obtained, although the model was evidently under-powered. Besides flying, a good deal of work was done in the workshop, two of the members making models for an exhibition which will be held shortly. This is the first aero club in Bolton and district, and much success is anticipated for 1912. A few more members are wanted, and any youths under 18 who are interested and would care to join are requested to communicate with the hon. sec., J. Scott-Taggart.

Stony Stratford & District Kite & Model Ae.C. (OLD STRATFORD)

OWING to the New-year Social of the Baptist Church senior classes on Thursday, January 4th, being held in the Institute, it was decided to postpone the meeting announced for that date till Thursday, January 11th, at 8 p.m., when a good turn-out of members is expected. Will members also please note that the field is now clear of all flood water, and it is possible to fly without paddling. Owing to the calm on Saturday, the kite-flying members who turned up did not get any flying at all.

Wanstead and District Model Aero Club (LAMMAS VILLA, BUCKINGHAM ROAD, WOODFORD).

THIS club has now been formed with the object of promoting model aeroplaning in the districts of Woodford, Wanstead, Leytonstone, and Leyton, but the membership is not limited to these boundaries, and those interested near by will also be welcomed. The club proposes to properly commence its existence with the New Year, a general meeting being held at the above address on Thursday, January 4th, at 7.30 p.m., unless otherwise stated, and it is to be hoped that all interested will make arrangements allowing them to attend. Meanwhile, will those not yet having done so communicate with H. S. Green, as above. Catalogues of models and accessories will be welcome.

Yorkshire Ae.C. (Model Section) (5A, HULLAND ST., LEEDS).

AT the Carlton Hill Aerodrome, on Saturday last, much brilliant flying was done by the usual "stars," Messrs. Beckett, Thornton and Whitaker. Mr. Beckett was out testing a new 4-foot monoplane, which showed good promise for an excellent flyer. Mr. Thornton also testing a new machine, but had misfortune to break a propeller at second test. The next meet will be held in East End Park, to-day, Saturday, at 2.30 p.m. Members not knowing this district had better take York Road terminus tram-car from town to Victoria Avenue, one entrance to the park, fare 1*d*. A hearty welcome to all interested.

SCHOOL AERO CLUB.

Southgate County School Aero Club (84, BOWES ROAD, N.).

A DISTANCE competition was held on Thursday, December 21st, at Palmer's Green. In spite of incessant wind and rain some half-dozen members were present with models. The first prize, a pair of 8-inch propellers, was won by E. R. Marsh ("Mann" type monoplane) with a flight of 310 ft., which is not at all bad when one remembers that the rain washed off the rubber lubricant as fast as it was put on, and that it was almost impossible to launch a model properly owing to the co-efficient of friction between the flying ground and one's boots having almost reached vanishing-point. Judging was carried out by E. R. Brown. A flying meeting will be held at Powys Lane, Palmer's Green, on January 5th, at 2 p.m.

BRITISH PATENTS.

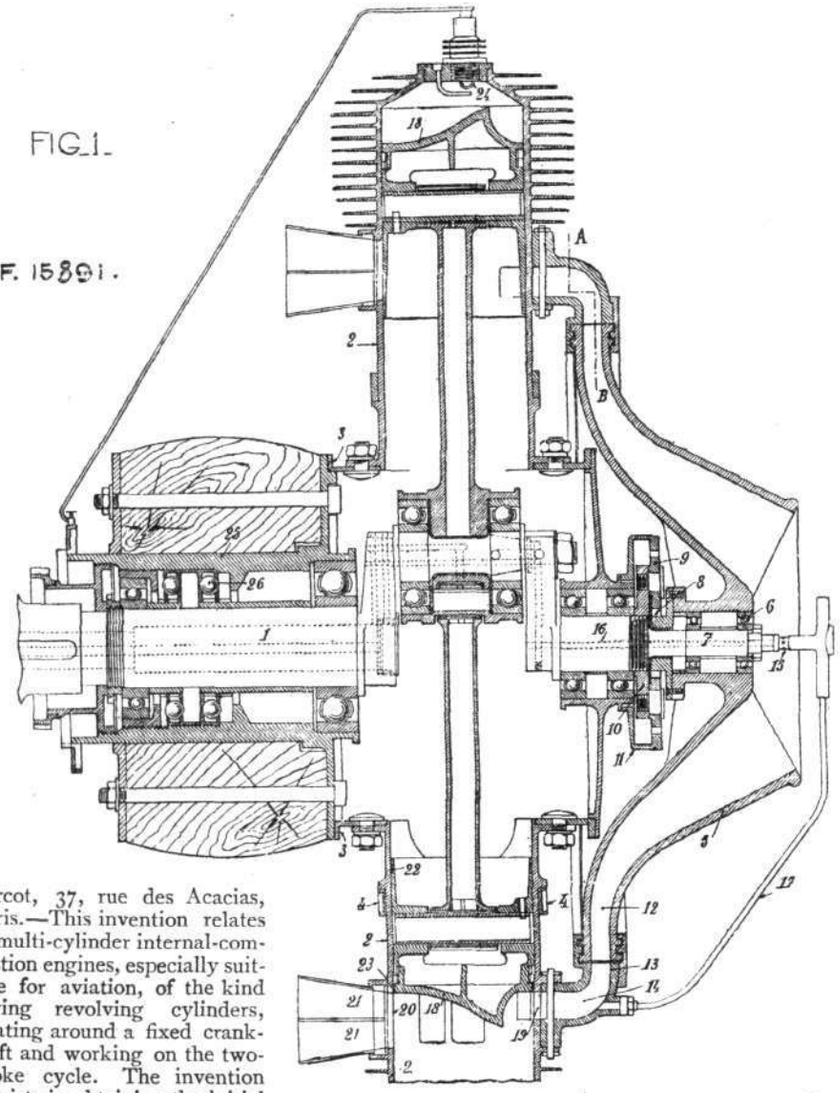
Specifications Selected and Abridged by James D. Roots, M.I.Mech.E., Thanet House, Temple Bar, London.

The first date given is the date of application ; the second, at the end, the date of the advertisement of the acceptance of the complete specification.

15,891. Date claimed under International Convention, July 20th, 1910. Date of Application in United Kingdom, July 8th, 1911. Improved Multi-Cylinder Engine especially suitable for Aviation. Mrs. Marguerite Farcot, 37, rue des Acacias, Paris.—This invention relates to multi-cylinder internal-combustion engines, especially suitable for aviation, of the kind having revolving cylinders, rotating around a fixed crank-shaft and working on the two-stroke cycle. The invention consists in obtaining the initial compression necessary for a two-stroke cycle engine by means of a centrifugal fan rotatively mounted on the end of the fixed engine-shaft and driven by the engine in the reverse direction to the latter, the draught created by the fan being guided on to vanes mounted in the inlet-opening of distribution-boxes fixed on the cylinders. Fig. 1 is a vertical longitudinal section of an engine. The motor has a stationary crank-shaft, 1, about which revolves the cylinders, 2, which are fixed on the faces of polygonal drum, 3, forming the periphery of the central crank-case. Two safety rings, 4, are arranged one at each side of the cylinders for connecting the whole securely together. The previous compression necessary for the working of the engine on the two-stroke cycle is obtained by a centrifugal fan, 5, mounted on ball-bearings, 6, on the end, 7, of the fixed shaft, 1, and driven by the rotary engine through a toothed ring, 8, in engagement with toothed wheels, 9, carried by a plate, 10, fixed on the shaft, 1. The toothed wheels, 9, engage with internal teeth on a plate, 11. Owing to this arrangement the engine drives the fan in the reverse direction to and at a greater speed than its own. The air forced in by the fan, 5, is guided by the blades, 12, on to the guide-vanes, 13, arranged in the inlet-opening of the distribution-chamber, 14, of each cylinder. As these guide-vanes are integral with the cylinders and consequently share their rotation, which rotation as we have seen is in the opposite direction to that of the fan, a high compression can be obtained in the distribution-chamber. The carburation of the air is obtained by a sprayer, 15, mounted on the end of the crank-shaft and receiving the petrol through an axial duct, 16. The atomisation of the petrol is completed by jets of compressed mixture, which suitable ducts, 17, coming from the distribution-chambers, 14, guide to the sprayer in the opening of the fan. From the distribution-chamber, 14, the carburetted air under pressure reaches the cylinder, 2, when each piston, 18, has uncovered the admission-openings, 19, and when the gases of combustion contained in the cylinder have been discharged through the exhaust-openings, 20. These exhaust-openings are provided with expansion-cones, 21, of suitable section for the purpose of increasing the speed of the exhaust gases and producing thereby a relative vacuum in the cylinder which will facilitate the entry of the carburetted air. The pistons, 18, of the cylinders are made of aluminium to obtain maximum lightness, and in order to ensure minimum friction with perfect safety, rings, 22 and 23, have been adopted, arranged at the two ends of the piston, so as to take up the lateral stresses exerted on these pistons. The ignition of explosive mixture is effected by spar plugs, 24, at the centre of the cylinder-heads. The screw-propeller is fixed on a sleeve, 25, rigidly connected with the revolving part of the engine and rotating on a ball-bearing, 26, on the fixed shaft.—December 13th, 1911.

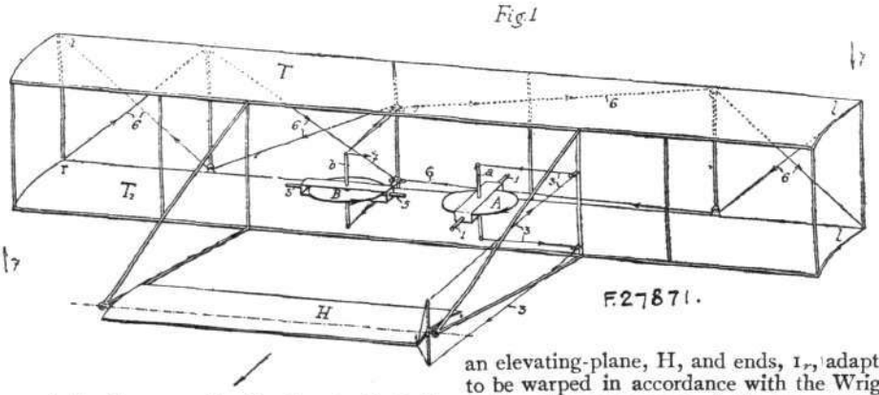
FIG. 1.

F. 15891.



27,871. November 30th, 1910. Improvements in Apparatus for Maintaining the Equilibrium of, and for Steering, Aerial or other Vehicles. Edmund Sparmann, 3, Landergerichsstrasse, Vienna VIII.—This invention relates to an apparatus for maintaining the equilibrium of, and for steering, aerial vehicles, based upon the known property of the gyroscope which has already been utilised for adjusting or steering purposes, this property residing in the fact that a gyroscope rotatable merely about two axes perpendicular to each other (axis of rotation and axis of oscillation), upon experiencing a force which tends to cause it to rotate about a third fixed axis perpendicular to both the other axes, oscillates—that is to say, effects what is called a precessional movement—in such a manner that the axis of rotation of the gyroscope moves perpendicularly to the plane prior to the commencement of the movement of precession of the axis of rotation and the axis of oscillation of the gyroscope. Fig. 1 illustrates a method of mounting the gyroscopes. In an aeroplane with supporting-planes, T, T_2,

Fig. 1



an elevating-plane, H, and ends, 17, adapted to be warped in accordance with the Wright system, two gyroscopes, A, B, are mounted, their vertical axes of rotation, *a* and *b*, respectively, being capable of oscillating around

the horizontal shafts, 1–1 and 5–5, respectively, the shaft, 1–1, of the gyroscope, A, serving to correct for elements tending to disturb the longitudinal stability of the aeroplane, and being mounted in the direction of flight; while the axis of oscillation, 5–5, of gyroscope, B, which serves to preserve lateral stability, lies perpendicularly and horizontally to the direction of flight. The moment of inertia of the gyroscope, A, must be relatively large, because its movement of precession is intended to operate the rudder; the gyroscopes also exert great gyratory force, and therefore possess the advantage of damping the vibration of the aeroplane to a considerable extent. The gyroscopes act directly (that is, without an auxiliary motor) on the steering-planes, so that, as compared with apparatus in which steering is effected by means of an auxiliary motor, the increased weight due to the use of larger gyroscopes is compensated for by the reduction in weight due to dispensing with such motor; in addition, the magnitude and velocity of the regulating effect are dependent upon the disturbing force, the latter at once making itself felt upon the steering members; while, with an auxiliary motor, it is first of all necessary to operate a starting or switching device, and some interval of time is necessary for the starting of the motor. Another advantage of direct transmission lies in the dependence of the automatic stabilising from the operation of the motor for driving the aeroplane. Each of the gyroscopes acts through cables 3 and 6, respectively, or through rods directly upon the stabilising surfaces on the elevating-plane and the tips, 1*r*, of the supporting-planes, which are adapted to be warped. Consequently, when some disturbing force, such as a gust of wind, or movements of the passengers or the like, arises, and tends to cause the vehicle to incline in the direction indicated by the arrow, 4, the gyroscope, A, moves in the direction of the arrows indicated on the cables about the shaft 1–1, and shifts the cables in such a manner that the rudder, H, counteracts the force tending to upset longitudinal stability by increasing the angle of incidence. Similarly the gyroscope, B, acts upon the cables, 6, in the direction of the arrows marked, when some force tends to turn the apparatus in the direction of the arrow, 7.—December 13th, 1911.

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CORRESPONDENCE.

*** *The name and address of the writer* (*not necessarily for publication*) MUST *in all cases accompany letters intended for insertion, or containing queries.*

Correspondents communicating with regard to letters which have appeared in FLIGHT, would much facilitate ready reference by quoting the number of each letter.

The Aeroplane in War.

[1456] May I heartily endorse "R.A.'s" statements on bomb-dropping. With regard to the discussion on the military aeroplane held on the 6th inst., the writer is inclined to agree with Capt. Burke in that he considers three types to be necessary, or even goes one further than Capt. Burke, and says four. Of course, this would further complicate matters, but the Admiralties of the world keep up four main types of men-of-war (not to mention several sub-divisions), even though the loss of a certain amount of simplicity is thereby entailed, and there seems no reason why the military aviation authorities should not do the same if necessary.

On two of these, the single-seater scout and the two-seater, most men are agreed. The French Military authorities seem to consider a three-seater, to carry heavy weights and to perform long journeys, also necessary. To these three types might be added a fourth, one that is very similar to the first, but whose vital parts are protected by armour, and whose duty is to destroy, not to scout. Naturally, type (iv) would be heavier than type (i), and not quite so fast, but the armour on the former would almost make up for this slight difference; besides this, types (ii) and (iii) would be quite at the mercy of type (iv). All these types would probably be fitted with a gun of sorts, and types (ii) and (iii) with a bomb-tube as well.

Thurles, Co. Tipperary. O. D. ATKINSON.

The Military Aeroplane.

[1457] In answer to Major Baden-Powell, although of course I cannot speak authoritatively, I am decidedly of opinion that aeroplanes must be prepared for night work.

In warfare one must concentrate all the force at one's command to win. No omelettes are made without breaking eggs.

In modern warfare there is much more movement at night than formerly, and dawn attacks are likely to be undertaken frequently. How easily aeroplanes could have discovered and frustrated the night march we made at Tel-el-Kebir, or the movement of the Japanese left at Wa-fang-ku. A commander warned that his enemy is making a night march will have his men ready, but, if his aeroplanes report no movements, can let his men have their night's sleep. His cavalry and infantry patrols will have much less to do, and their strength may be diminished.

Again, if aeroplanes can thoroughly disturb an enemy's camp with showers of bombs, his men will lose some sleep and be so much the less fit for a fight next day.

Search lights, of course, show up the machines that carry them, so that a certain height, with its disadvantage of making reconnaissance more difficult, is necessary. Luminous bombs, acting like star shell, or the old smooth-bore parachute shell, would not have this disadvantage—besides the weights are very different. On the other hand the searchlight would be much more certain and efficient. Adopting Major Radcliffe's classification, which seems reasonable to me, the heavier machines could carry searchlights, the lighter ones bombs. I believe, as I have said from the first, that every machine will carry a bomb-tube. It may be made quite light, and would be useful in so many circumstances. Bombs of the hand-grenade order, weighing about 4 lbs. each, have proved to be very effective, and could conveniently be released by the action of a pedal. The luminous bombs must be heavier, no doubt, but the same tube would do for them. When a reasonably accurate instrument for measuring speed and direction over the ground has been elaborated, the necessary adjustments of the sight (which must be gymballed) of the bomb-tube can easily be made. It is not a question of hitting a small bull's-eye.

Why should not aerial engines have silencers with cut-outs, like car or bicycle engines? One realises, of course, that it would not be possible to use revolving engines, but is that so great a matter? The revolving engine has the further disadvantage that it cannot be protected from bullets. Probably we shall soon have either an 8-cyl. or a turbine engine, which would not want the fly-wheel effect. R.A. (Retired).

War Office Trials.

[1458] In connection with the War Office trials there has been a great deal of talk about the British *aeroplane*, but may I be permitted to ask the simple question "what about the British *engine?*" It appears to me as a mere onlooker that the Government has been slightly illusioned by its first sight, so to speak, of the machine that it has hitherto ignored. Any student of aviation will tell you that we should not be flying to-day but for persistent efforts of the aeroplane engine builder. What did the Wrights do when they wanted to transfer their attentions from gliding to flying? They just started out to build an engine.

All credit, of course, to the designer of the aeroplane and all appreciation of the pluck of the pilot; but skill and courage in the building and use of wings was of little avail before the engineer provided adequate power for weight in his motors. True, some most admirable work is being done by engines that are not conspicuous for their extreme lightness at the present time, but when it comes to development and design of a progressive character there is not the least doubt that the utmost efforts of the engine builder are needed to ensure success. It is only needful to consider for a moment the enormous influence that the Antoinette, Anzani, and the much-talked-of Gnome motors have exercised on successive stages of aviation to appreciate how paramount is this branch of the subject.

Yet the Government has, apparently, been illusioned by the great spread of the wings into ignoring the very existence of the vital thing, the little engine. Competition conditions permit of a British machine being fitted with a foreign engine, but there would indeed be just as much justification if it were the British engines that might be fitted to foreign wings. After all, an engine and propeller are theoretically capable of accomplishing flight on their own account, whereas the wings alone are only good for gliding.

And there is another aspect of the situation that makes the Government attitude still more unfair, which is that it will cost the engine builder far more money to produce a special type than it will cost the builder of the aeroplane structure. The prize, if it is awarded at all, goes to the aeroplane builder, while the engine builder gets nothing at all for his special pains. Surely the Government might remedy this condition before it is too late. It would be contrary to nothing that they have promised thus far if they were to add to the prize scheme a special prize for British engines of, say, £10,000. Surely we, Great Britain, can afford to pay something more than we offer at present in order to get the best.

"ALL-RED."

The Filey Disaster.

[1459] Mr. Blackburn's explanation of the Filey disaster, appearing in your issue of December 16th, is interesting, but his calculations are incorrect. The velocity, V, at the end of a fall, *h*,

is given by $V^2=v^2+2gh$, where v is the velocity at start. In the present case, $v = 95$ f.p.s. (65 m.p.h.), $h = 550$, $g = 32{\cdot}2$, and $V=210$ f.p.s., or 140 miles per hour. This supposes the machine falling in vacuo under the influence of the weight alone. It therefore neglects resistance and the thrust of the propeller. If the latter were working, it would probably just balance the resistance; but, on the other hand, if the engine were stopped when starting the dive, the resistance would diminish the final velocity.

The force on the planes when attempting to take a horizontal direction is given by the principle of momentum. The whole of the vertical momentum being destroyed, this force is given by

$$\text{F in tons} = \frac{\text{W in tons}}{g} \times \frac{V}{t} \times \cos\theta,$$

where W is the weight, V velocity in f.p.s., t the time taken to flatten out, and θ is the angle the line of dives makes with the vertical. Substituting $W = {\cdot}6$, $V=210$, $g=32{\cdot}2$, $\theta=35^\circ$, $F=\frac{3{\cdot}1}{t}$. If the flattening out is instantaneous, t is very small and F very great. Actually t will be of appreciable amount. Taking $t=\frac{1}{6}$ sec., $F=15\frac{1}{2}$ tons; whilst if $t=\frac{1}{2}$ sec., $F=6{\cdot}2$ tons. In the latter case the force on the wings is ten times the force due to supporting the weight. If t is 5 secs., the machine will have travelled 1,050 ft. while flattening out, and the total force on the wings will be double the usual.

Upper Tooting. A. W. JOHNS, R.C.N.C., M.IN.N.A.

[1460] I notice, on looking through the correspondence *re* the Filey Disaster that almost all of your correspondents take g as $=32{\cdot}2$, not taking into account the fact that the fall was not vertical, but at an angle of 65°, in which case g becomes $32{\cdot}2 \sin 65^\circ$, or $29{\cdot}183$.

Again Mr. G. H. May [1451] multiplies 65 by $\frac{88}{60}$ to turn it from m.p.h. into f.p.s., instead of by $\frac{88}{60}$.

Taking these figures, $u = 65$ m.p.h. $= \frac{286}{3}$ f.p.s., $g = 29{\cdot}183$, $h=550$.

$$\begin{aligned} V^2 &= u^2+2gh \\ &= (\tfrac{286}{3})^2 + 2\times 550\times 29{\cdot}183 \\ &= 9088{\cdot}4 + 32101{\cdot}3 \\ &= 41189{\cdot}74 \text{ f.p.s.} \end{aligned}$$

$\therefore V = 202{\cdot}95$ f.p.s., or $138{\cdot}375$ m.p.h.

Then, taking $P = {\cdot}003V^2$, $P = {\cdot}003 \times 19147{\cdot}641$
$= 57{\cdot}44$ lbs. per sq. ft.,

and area of planes $= 290$ sq. ft.

$\therefore$ Total pressure due to velocity $= 57{\cdot}44 \times 290$ lbs. $= 16{,}658$ lbs.

Again, we have to add in stress put on planes owing to weight of machine.

This stress $= 2 \times 1350 = 2{,}700$ lbs.

$\therefore$ Total pressure on planes $= 16{,}658 + 2{,}700$ lbs. $= 19{,}358$ lbs. $= 8{\cdot}6$ tons.

This, I think, differs from other estimates as published in FLIGHT.

Edinburgh. J. C. S. MACGREGOR.

"A Study of Bird Flight."

[1461] Dr. Hankin shows himself such a capable and honest observer that one does not like to criticise him hastily, but perhaps the discussion of one or two points may enlighten the weaker brethren—of whom I am one.

It seems to me that in the treatment of flapping flight, especially poise flapping or hovering, that he does not give enough weight to the gliding tendency, and that this to some extent vitiates his observations. On page 955, indeed, when treating of "half flaps," he acknowledges the presence of this gliding element, but so far he has made no other reference to it.

Now it is obvious that even in full flapping—*e.g.*, in hovering—the bird's wings pass through the most efficient gliding position, and on to an extreme dihedral in both directions. That is to say, its efficiency as a glider would vary, say, from 1 to 90, where 100 is absolute efficiency.

The average, then, must be quite worth consideration, and at any rate there is one moment in each flap where the wings are at maximum gliding efficiency. The result of this is that there is a positive *forward* tendency which must be counteracted by some backward reaction in the flap if the bird wishes to hover, *i.e.*, the wing tips must show a negative angle of incidence, or else there must be a backward motion of the whole wing.

Further, the flap has not to sustain the whole weight of the bird, but only that part which is not equalized by the gliding reaction.

It is obvious that a bird when half-flapping may be using its wings as propellers, and what we may call the aeroplane effect is then seen—*i.e.*, it is sustained by the reactions against the wing caused by forward motion, and not by direct downward reaction of the wing beat.

If we followed this line of thought into full-flapping progress, we see that an appreciable fraction of the weight must be so sustained, even though the gliding efficiency has been greatly reduced.

I have noticed frequently an interesting example of this gliding reaction in flight shown in the flight of gulls. When travelling from place to place against a slight wind, their wings work quite leisurely, but if they turn round with the wind they have to flap away at a tremendous pace to keep up at first. As has already been pointed out, I think, by one of your correspondents, if instead of a glider being propelled through the air, it either (1) glides in a rising current or (2) glides while exercising a downward reaction from its wing area, then it will both be sustained, and travel forward at a speed limited by the head resistance. The application of this to flapping flight is both interesting and instructive.

Dublin. P. D. M.

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MESSRS. WILLIS BROTHERS, of 60, Cambridge Road, Hastings, ask us to state that by mutual arrangement they are no longer associated with Messrs. Mann and Grimmer. They are, however, still supplying machines, parts, and all model materials, &c., and are making a speciality of rubber and lubricant.

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PUBLICATIONS RECEIVED.

Aeronautische Meteorologie. Part I. By Dr. Fr. Linke. Frankfort: F. B. Auffarth. Price 3 marks.

Aeronautische Meteorologie. Part II. By Dr. Fr. Linke. Frankfort: F. B. Auffarth. Price 3 marks 50.

Chemie der Gasse. By Dr. Fr. Brahmer. Frankfort: F. B. Auffarth. Price 4 marks.

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Aeronautical Patents Published.

Applied for in 1910.

Published January 4th, 1912.

29,148. I. M. SAWYER. Steering device for aeroplanes.

Applied for in 1911.

Published January 4th, 1912.

2,904. G. MEES. Flying machines with gyroscopically-acting stabilising propellers.

3,125. G. H. CHALLENGER AND BRITISH AND COLONIAL AEROPLANE CO Supporting planes.

3,532. G. AND M. ANTONI. Aerial machines.

3,596. W. E. BACK. Propulsive power for aeroplanes.

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